TUGAS MINGGU KE-14

STATISTIKA DESKRIPTIF

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PROGRAM STUDI S1 SISTEM INFORMASI

FAKULTAS SAINS DAN TEKNOLOGI

UNIVERSITAS AIRLANGGA

2021

Tugas pertemuan 28 → dikumpulkan hari ini, tgl. 18-06-2021 jam 23.59 → di upload ke Aula dan kirim ke email eto-w@fst.unair .ac.id dengan subject : CA dan MCA

Code dan outputnya jadikan satu di notebook R-nya

1. Carilah **3 dataset** yang sesuai untuk CA kemudian lakukan Visualization and interpretation :
    - Statistical significance
    - Eigenvalues / Variances
    - Biplot
    - Graph of row variables
    - Graph of column variables
    - Biplot options
    - Dimension description

2. Carilah **3 dataset** yang sesuai untuk MCA kemudian lakukan Visualization and interpretation :
    - Eigenvalues / Variances
    - Biplot
    - Graph of variables
    - Graph of individuals
    - Color individuals by groups
    - Dimension description

==========

Code ditaruh diantara tanda berikut :

```{R}

Syntax di sini

```

```
library(FactoMineR)
library(factoextra)
library(ca)
library(ade4)
library(MASS)
library(ExPosition)
library(cluster.datasets)
library(flexclust)

```{R}
#Dataset 1
# Preparation
library(flexclust)
library(FactoMineR)
library(factoextra)
library(corrplot)
# CA
data("achieve")
ach.ca <- CA(achieve, graph = FALSE)
ach.ca
```
```

Results of the Correspondence Analysis (CA)
The row variable has 25 categories; the column variable has 4 categories
The chi square of independence between the two variables is equal to 1.729739 (p-value = 1).
*The results are available in the following objects:

   name   description
1 "$eig"   "eigenvalues"
2 "$col"   "results for the columns"
3 "colcoord"   "coord. for the columns"
4 "colcos2"   "cos2 for the columns"
5 "colcontrib"   "contributions of the columns"
6 "$row"   "results for the rows"
7 "rowcoord"   "coord. for the rows"
8 "rowcos2"   "cos2 for the rows"
9 "rowcontrib"   "contributions of the rows"
10 "$call"   "summary called parameters"
11 "$call$marge.col" "weights of the columns"
12 "$call$marge.row" "weights of the rows"
```
```{R}
# Statistical Significance
# Chi
Chi1 <- 1785.433

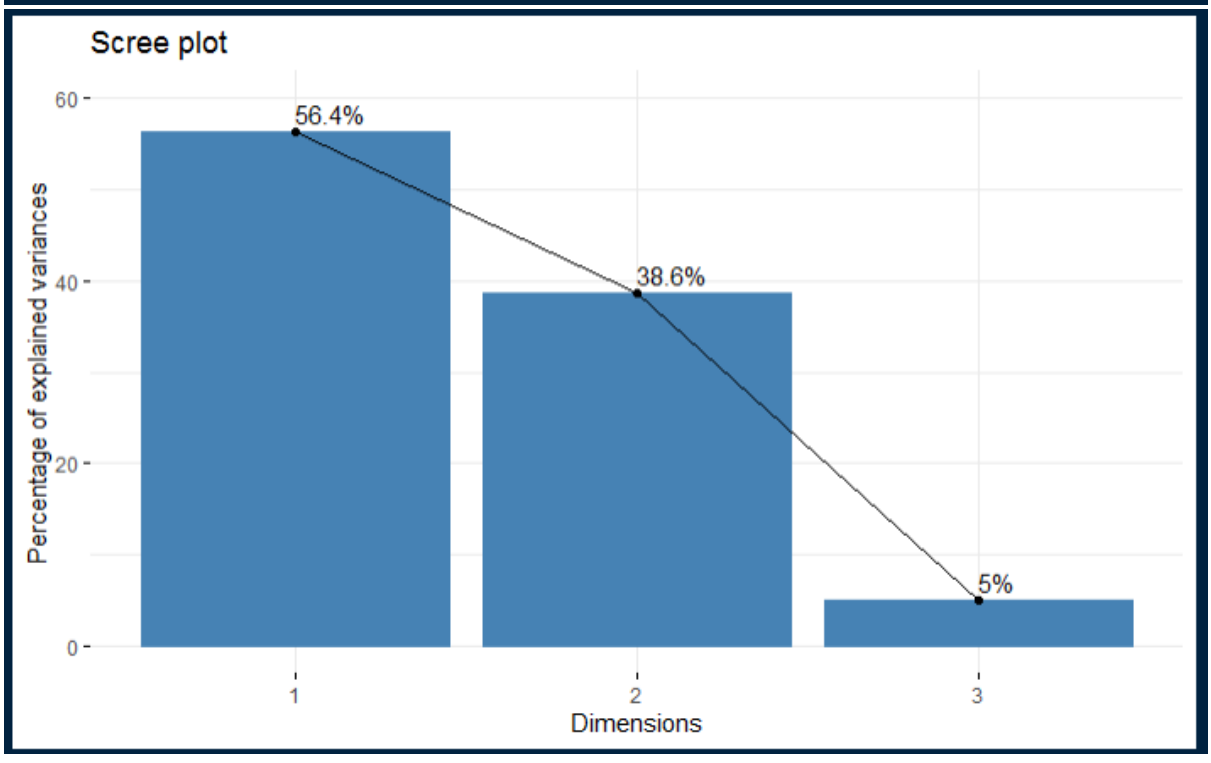
# Degree of Freedom
DF1 <- (1/(nrow(achieve)-1))*100
DF1
DF1.1 <- (1/(ncol(achieve)-1))*100
DF1.1
```
```

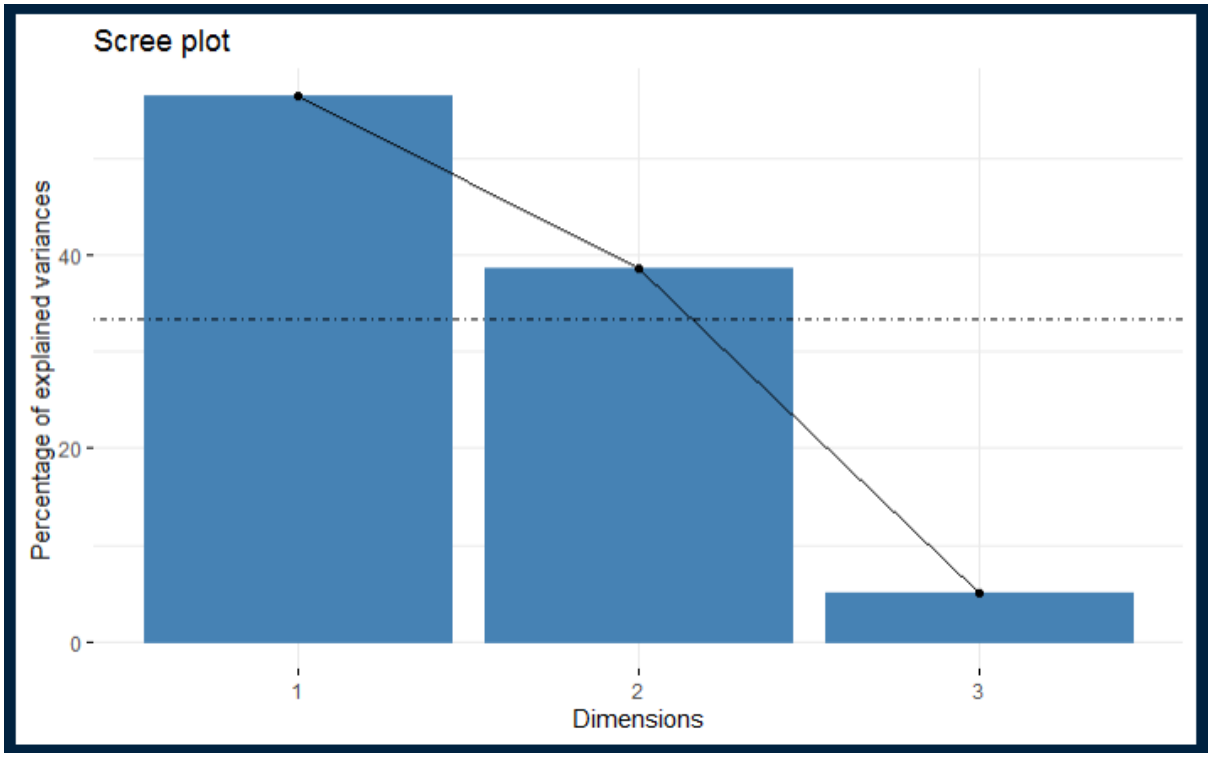
```
#P-Value
PVal1 <- pchisq(Chi1, df = DF1, lower.tail = FALSE)
PVal1
```

```
[1] 4.166667
[1] 33.33333
[1] 0
```

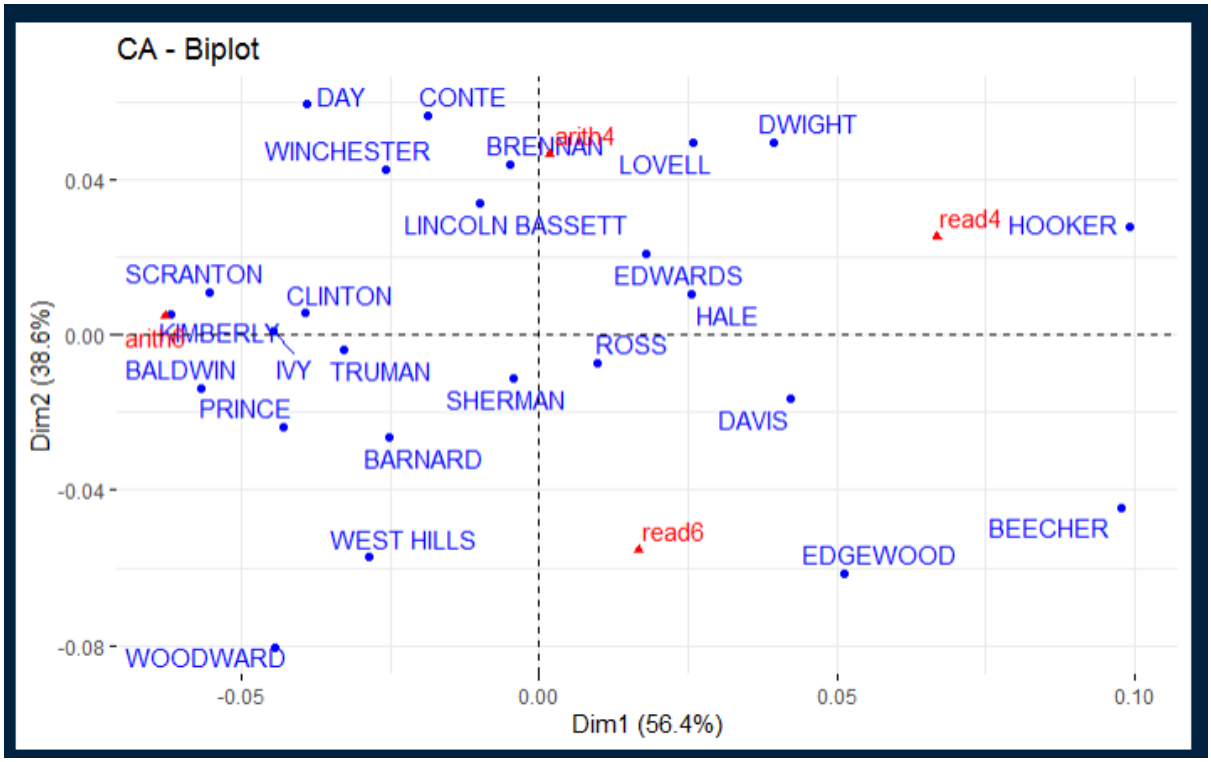
```{R}
# EigenValues & Variances
ach.ca.eig <- ach.ca$eig
ach.ca.eig
fviz_screeplot(ach.ca, addlabels = TRUE, ylim = c(0, 60))
fviz_screeplot(ach.ca)+geom_hline(yintercept = DF1.1, linetype
= 4, color = "black")
```

```
      eigenvalue percentage of variance cumulative percentage of variance
dim 1 0.0021626220              56.386696                           56.38670
dim 2 0.0014810629              38.616198                           95.00289
dim 3 0.0001916561               4.997106                          100.00000
```






```{R}
# biplot
fviz_ca_biplot(ach.ca, repel = TRUE)
```




```{R}
# Graph of Row Variable
ach.ca.row <- ach.ca$row
ach.ca.row
```

$coord

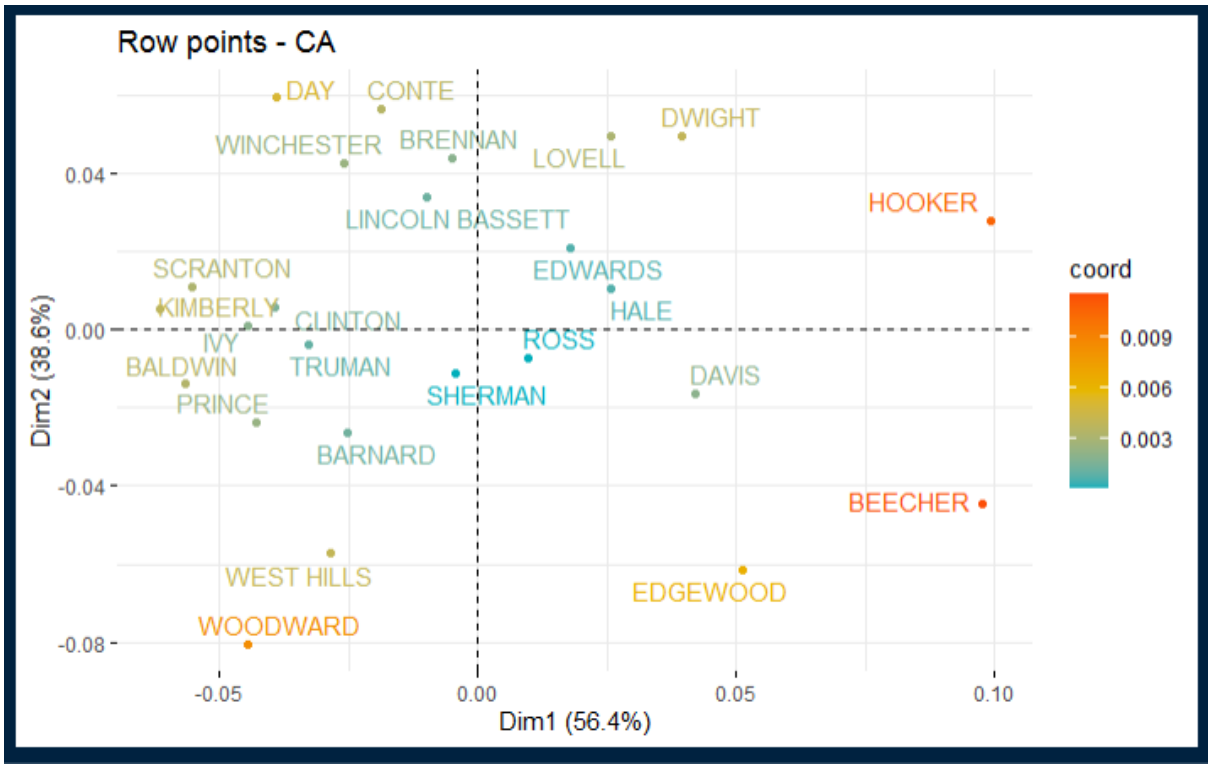
	Dim 1	Dim 2	Dim 3
BALDWIN	-0.056622550	-0.013584907	0.027747903
BARNARD	-0.025312307	-0.026511812	-0.021431076
BEECHER	0.097619028	-0.044697046	-0.005546907
BRENNAN	-0.004998669	0.044144686	0.029229291
CLINTON	-0.039364380	0.005573299	0.003904943
CONTE	-0.018833523	0.056389945	0.008678450
DAVIS	0.042060572	-0.016284684	0.003002218
DAY	-0.039069033	0.059474858	-0.013810511
DWIGHT	0.039391149	0.049776092	-0.005971997
EDGEWOOD	0.051149103	-0.061551912	0.012134774
EDWARDS	0.017826622	0.020869767	-0.010196124
HALE	0.025641860	0.010700213	-0.003652406
HOOKER	0.099238985	0.027883225	-0.005230379
IVY	-0.044591210	0.001037968	-0.005129175
KIMBERLY	-0.061684886	0.005323989	0.007785918
LINCOLN BASSETT	-0.009837366	0.033872955	-0.028158589
LOVELL	0.025797366	0.049651047	0.016584762
PRINCE	-0.043061529	-0.023731963	-0.021951916
ROSS	0.009765888	-0.007296770	0.010294004
SCRANTON	-0.055474992	0.010984742	-0.012669424
SHERMAN	-0.004236681	-0.011315346	-0.004938772
TRUMAN	-0.032745107	-0.003865788	-0.009640026
WEST HILLS	-0.028504947	-0.057371716	0.002692252
WINCHESTER	-0.025858958	0.042682325	0.019614587
WOODWARD	-0.044475685	-0.080536888	0.005715370

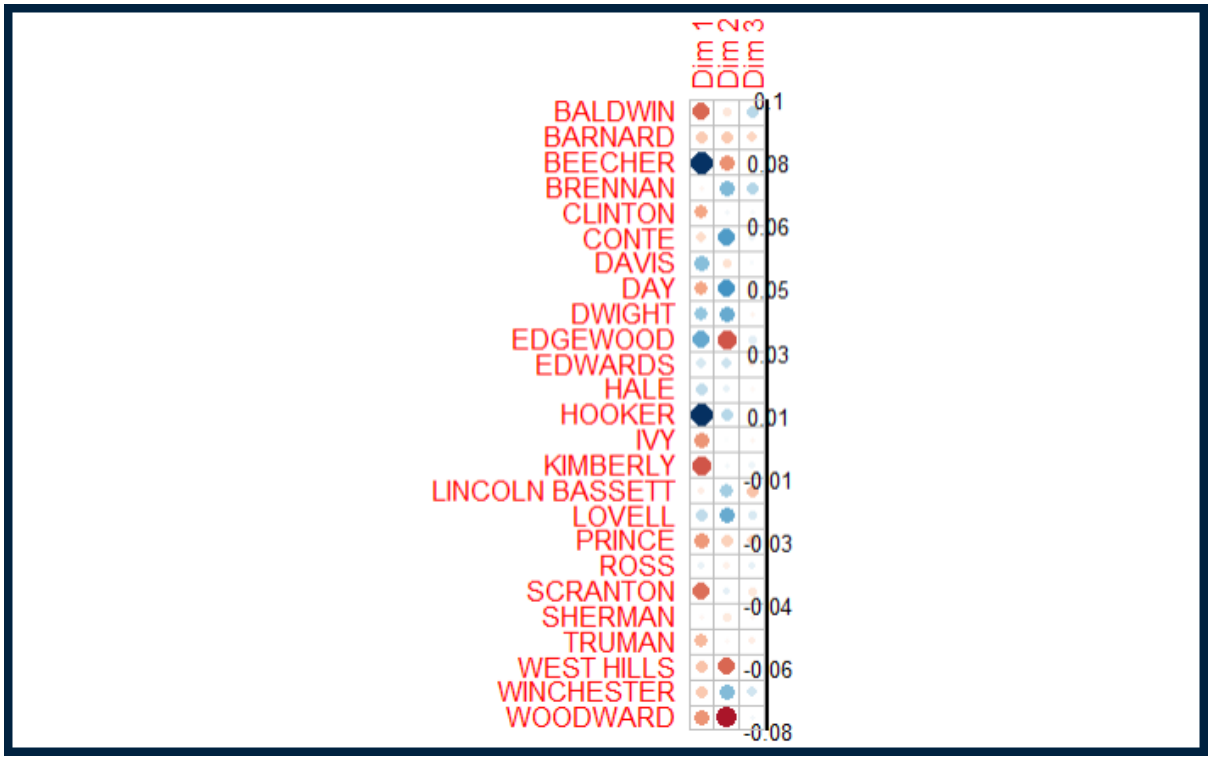
$contrib

	Dim 1	Dim 2	Dim 3
BALDWIN	4.99649289	0.419958991	13.5395691
BARNARD	1.30068305	2.083502262	10.5209286
BEECHER	20.71322175	6.340791575	0.7546378
BRENNAN	0.03970848	4.522083093	15.3203674
CLINTON	2.82793662	0.082774127	0.3140149
CONTE	0.55641319	7.283577541	1.3331427
DAVIS	3.93598024	0.861526015	0.2262794
DAY	2.39441587	8.102298156	3.3760733
DWIGHT	2.72042173	6.342897125	0.7055635
EDGEWOOD	6.75957539	14.293336055	4.2930388
EDWARDS	0.59625497	1.193263203	2.2010111
HALE	1.30106564	0.330820251	0.2978628
HOOKER	24.33461642	2.805130252	0.7627536
IVY	3.20067073	0.002532314	0.4778544
KIMBERLY	6.16392656	0.067047320	1.1080966
LINCOLN BASSETT	0.15974467	2.765553169	14.7689145
LOVELL	1.28277774	6.938484896	5.9824247
PRINCE	2.96583044	1.315351728	8.6970183
ROSS	0.19361165	0.157825256	2.4273634
SCRANTON	4.95378313	0.283615081	2.9155085
SHERMAN	0.03294180	0.343114188	0.5051169
TRUMAN	1.74796526	0.035573218	1.7094423
WEST HILLS	1.43288637	8.475671226	0.1442318
WINCHESTER	1.04895370	4.172895749	6.8100559
WOODWARD	4.34012170	20.780377209	0.8087297

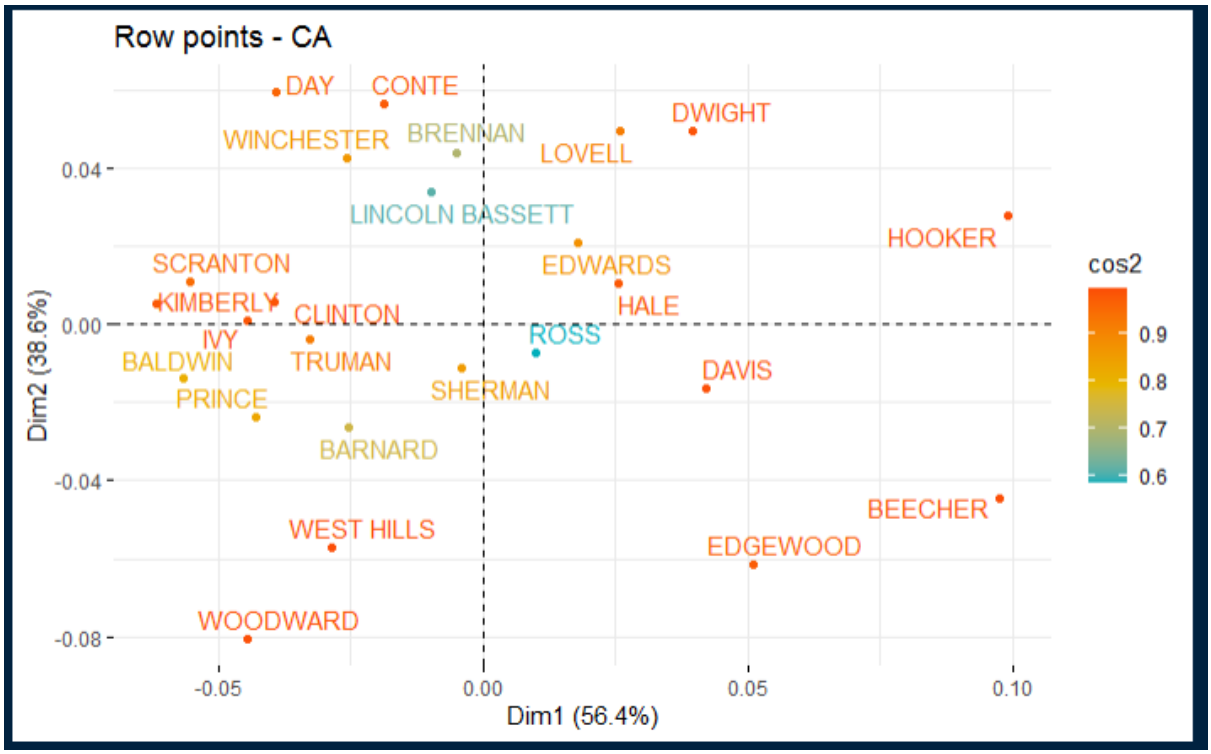
```
$cos2
                    Dim 1        Dim 2       Dim 3
BALDWIN         0.770587476 0.0443564133 0.185056111
BARNARD         0.355382972 0.3898629618 0.254754066
BEECHER         0.824486758 0.1728511900 0.002662052
BRENNAN         0.008835178 0.6890701198 0.302094702
CLINTON         0.970981101 0.0194638423 0.009555057
CONTE           0.098259564 0.8808765126 0.020863923
DAVIS           0.865802965 0.1297858724 0.004411163
DAY             0.290498561 0.6732021436 0.036299295
DWIGHT          0.381714069 0.6095122880 0.008773643
EDGEWOOD        0.399295220 0.5782307259 0.022474054
EDWARDS         0.370686709 0.5080472616 0.121266030
HALE            0.837223780 0.1457898535 0.016986367
HOOKER          0.924451754 0.0729802998 0.002567946
IVY             0.986414162 0.0005344766 0.013051361
KIMBERLY        0.977153160 0.0072791300 0.015567710
LINCOLN BASSETT 0.047506660 0.5632523197 0.389241021
LOVELL          0.195404029 0.7238350522 0.080760919
PRINCE          0.639547133 0.1942499894 0.166202878
ROSS            0.374624230 0.2091383827 0.416237387
SCRANTON        0.916282272 0.0359264645 0.047791264
SHERMAN         0.105350844 0.7514882301 0.143160925
TRUMAN          0.908590028 0.0126634252 0.078746547
WEST HILLS      0.197634122 0.8006028748 0.001763003
WINCHESTER      0.232570273 0.6336191386 0.133810588
WOODWARD        0.232799814 0.7633558080 0.003844378

$inertia
 [1] 1.402245e-04 7.915083e-05 5.433061e-04 9.719605e-05 6.298535e-05 1.224625e-04 9.831380e-05
 [8] 1.782527e-04 1.541270e-04 3.661052e-04 3.478609e-05 3.360766e-05 5.692734e-04 7.017175e-05
[15] 1.364192e-04 7.271977e-05 1.419706e-04 1.002893e-04 1.117677e-05 1.169199e-04 6.762231e-06
[22] 4.160499e-05 1.567944e-04 9.754000e-05 4.031809e-04
```

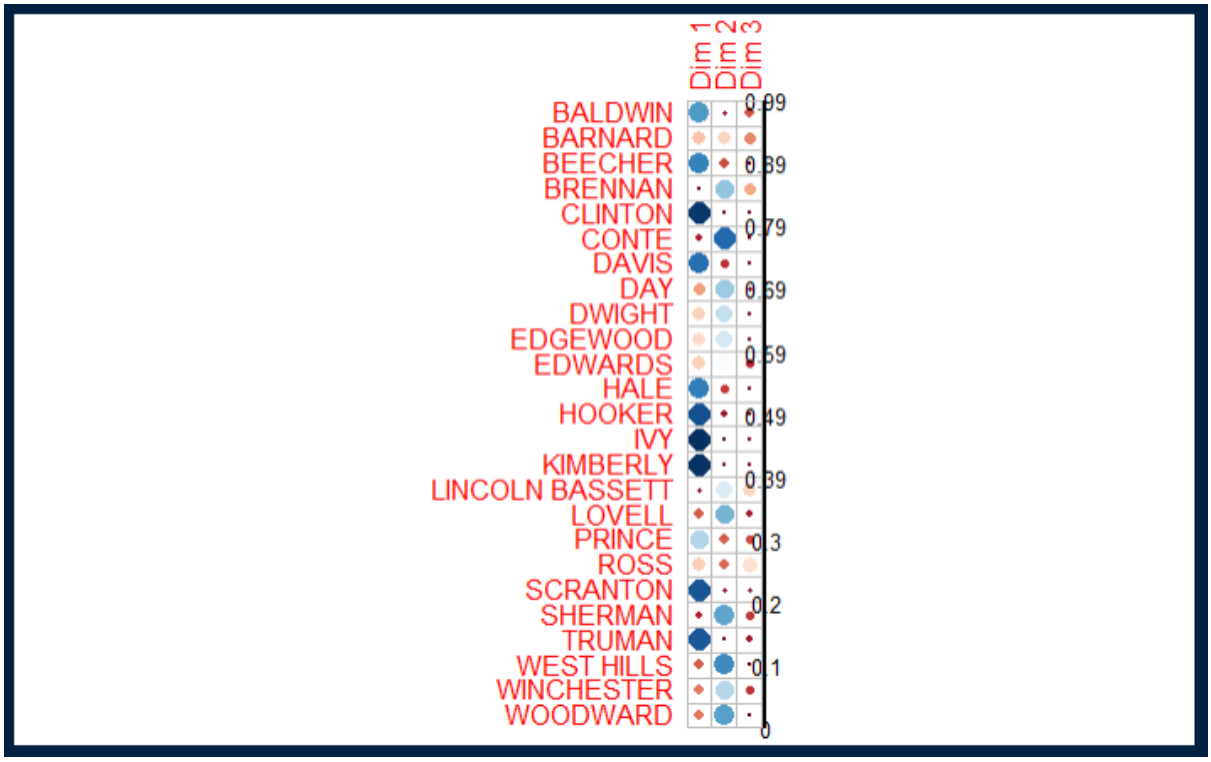
```
# Visual Row Variables
# Coord
fviz_ca_row(ach.ca, col.row = "coord", gradient.cols =
c("#00AFBB", "#E7B800", "#FC4E07"), repel = TRUE)
corrplot(ach.ca.row$coord, is.corr = FALSE)
```



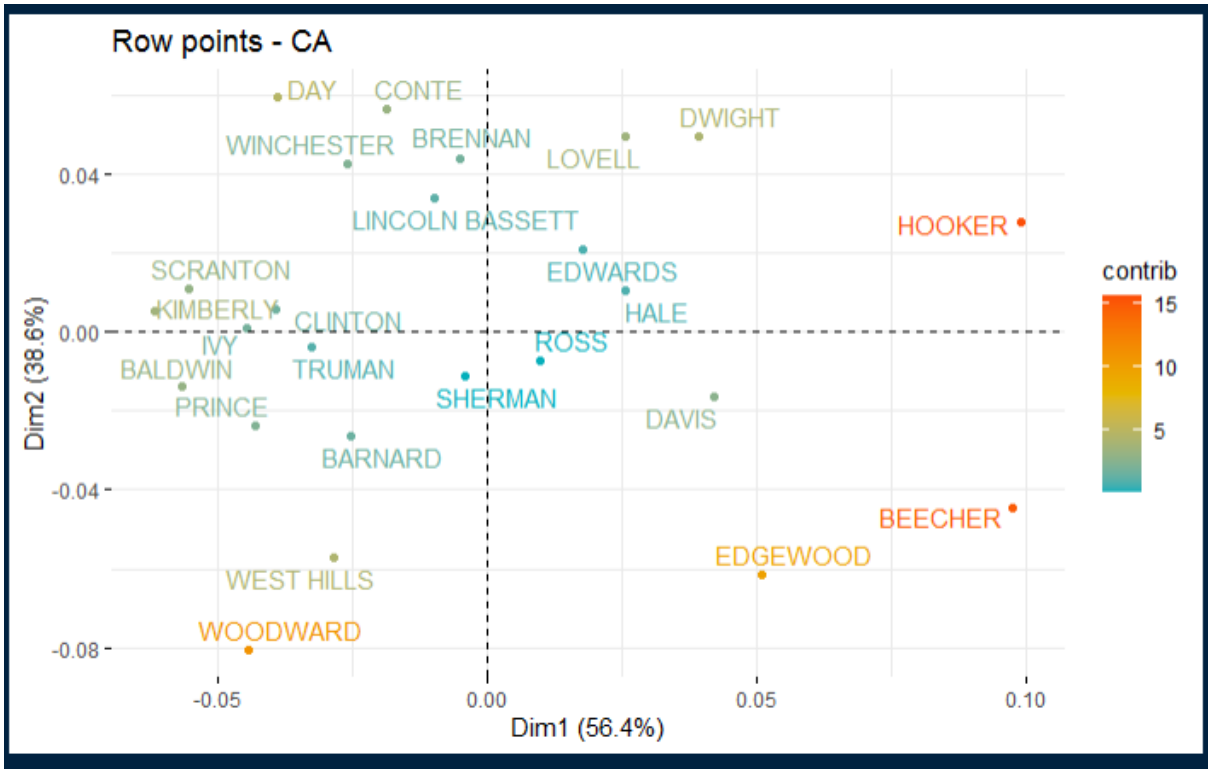


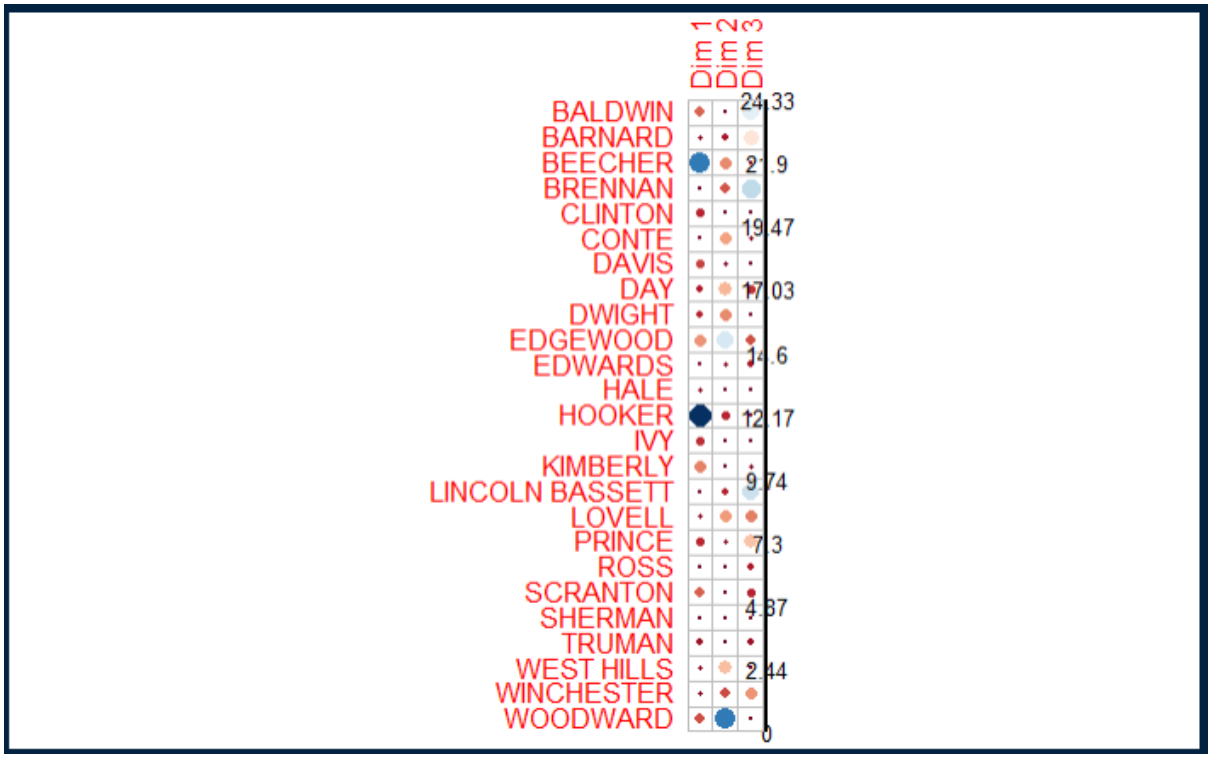

```
# Cos2
fviz_ca_row(ach.ca, col.row = "cos2", gradient.col =
c("#00AFBB", "#E7B800", "#FC4E07"), repel = TRUE)
corrplot(ach.ca.row$cos2, is.corr = FALSE)
```






```
#Contrib
fviz_ca_row(ach.ca, col.row = "contrib", gradient.col =
c("#00AFBB", "#E7B800", "#FC4E07"), repel = TRUE)
corrplot(ach.ca.row$contrib, is.corr = FALSE)
```

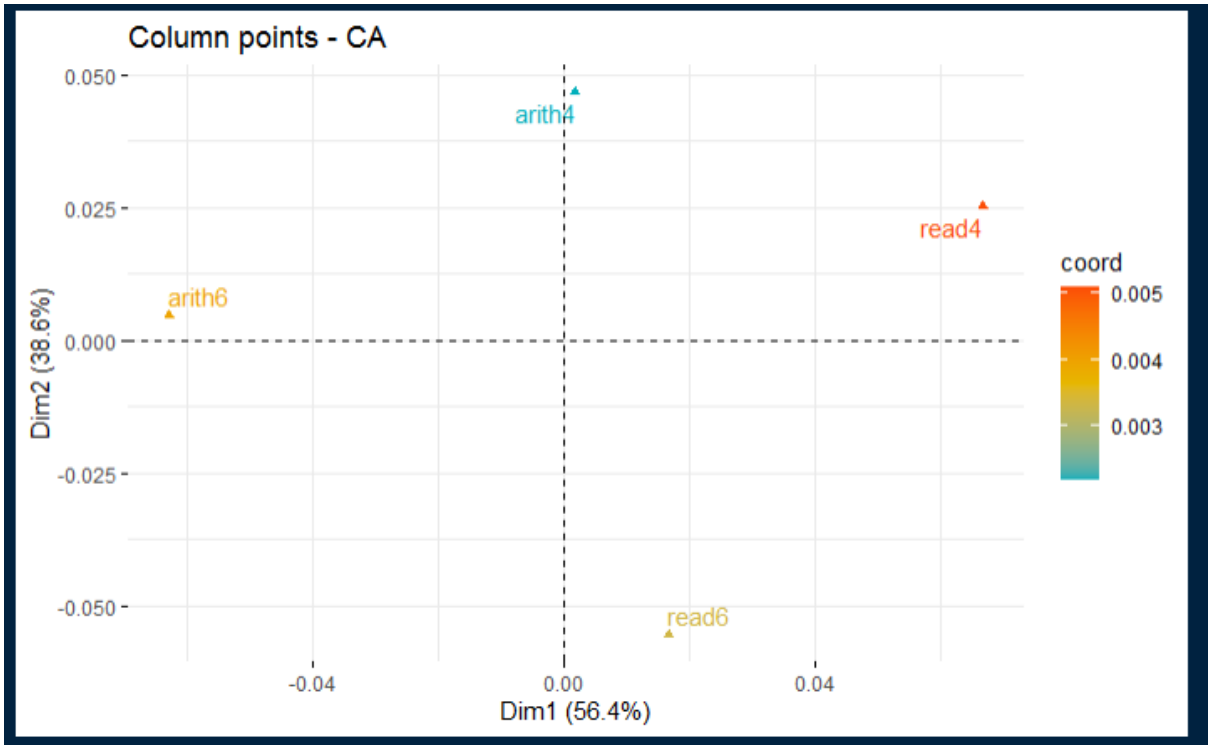


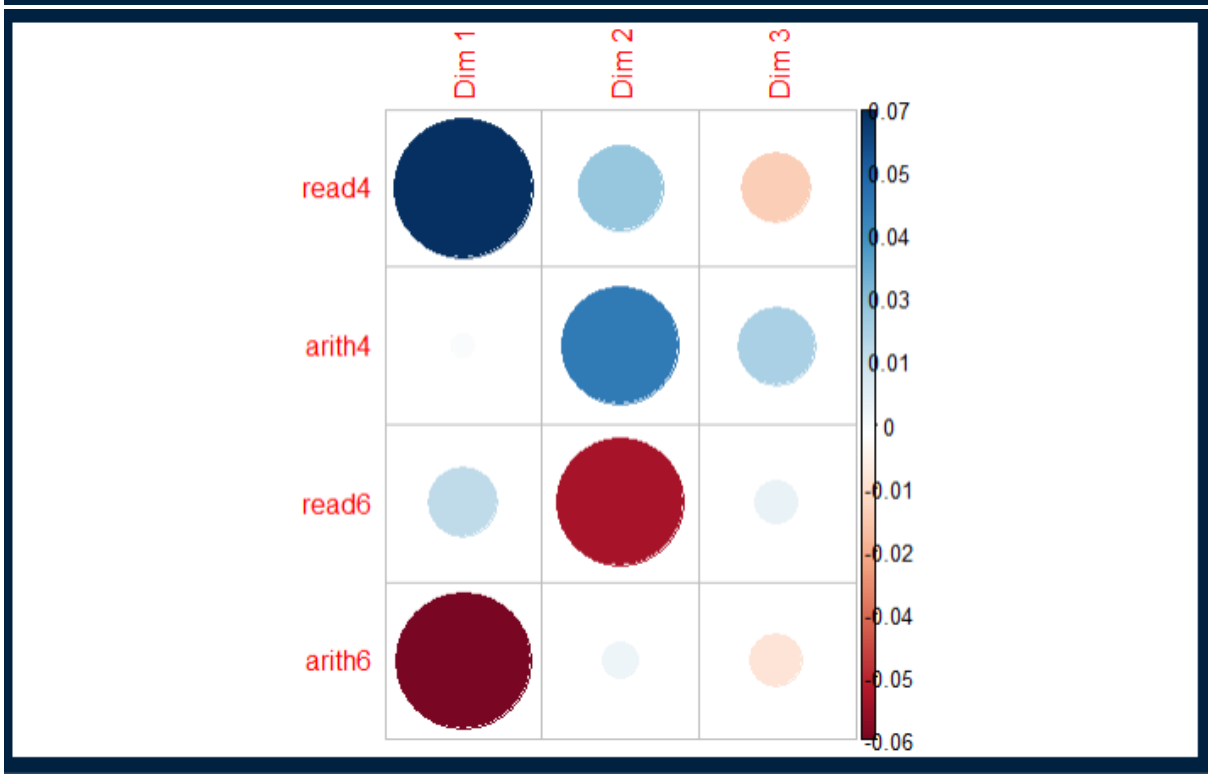



```{R}
# Graph of Column Variables
ach.ca.col <- ach.ca$col
ach.ca.col
```

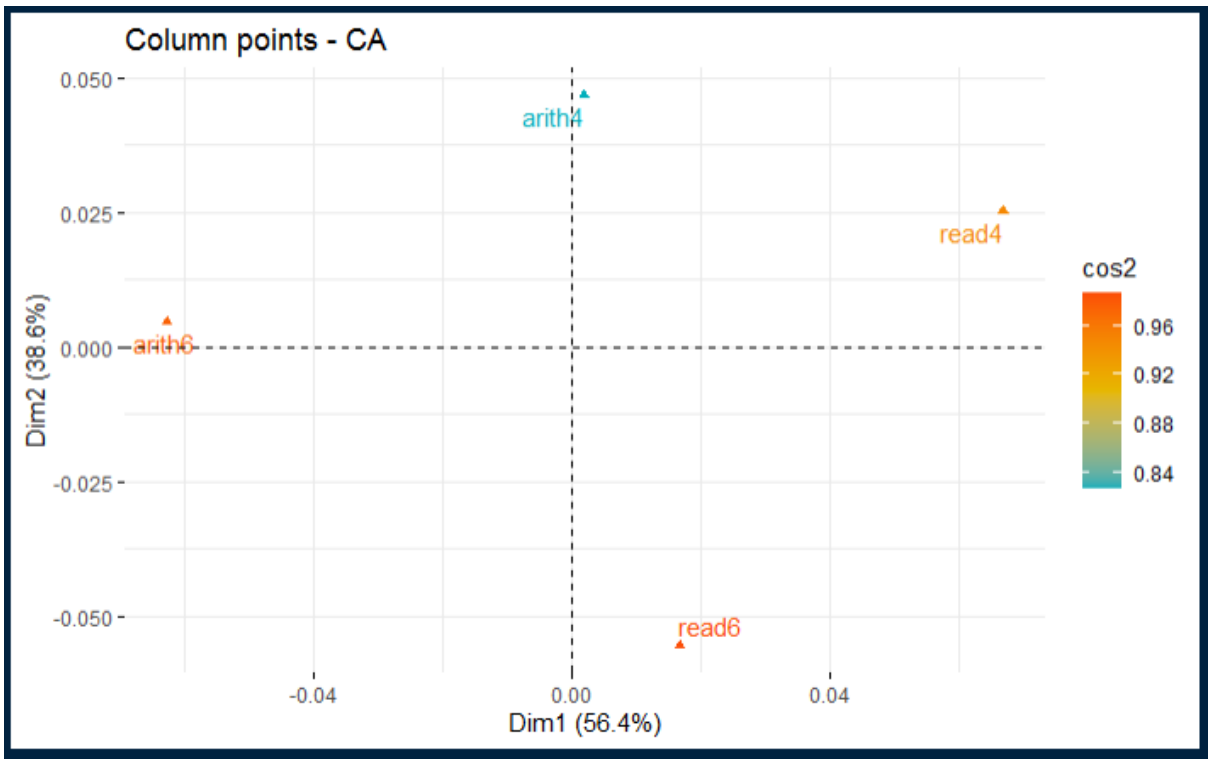
```
$coord
              Dim 1       Dim 2        Dim 3
read4   0.066715555  0.02539299 -0.016617721
arith4  0.001778934  0.04671458  0.021403439
read6   0.016728798 -0.05531941  0.006546445
arith6 -0.062735092  0.00477978 -0.009842335

$contrib
             Dim 1      Dim 2     Dim 3
read4  41.71029246  8.8231505 29.200482
arith4  0.03007752 30.2854852 49.130114
read6   3.78457512 60.4296220  6.539683
arith6 54.47505490  0.4617423 15.129722

$cos2
             Dim 1       Dim 2      Dim 3
read4  0.828561716 0.120032314 0.05140597
arith4 0.001197116 0.825508717 0.17329417
read6  0.082724554 0.904607216 0.01266823
arith6 0.970479467 0.005633537 0.02388700

$inertia
[1] 0.0010886769 0.0005433584 0.0009893804 0.0012139253
```

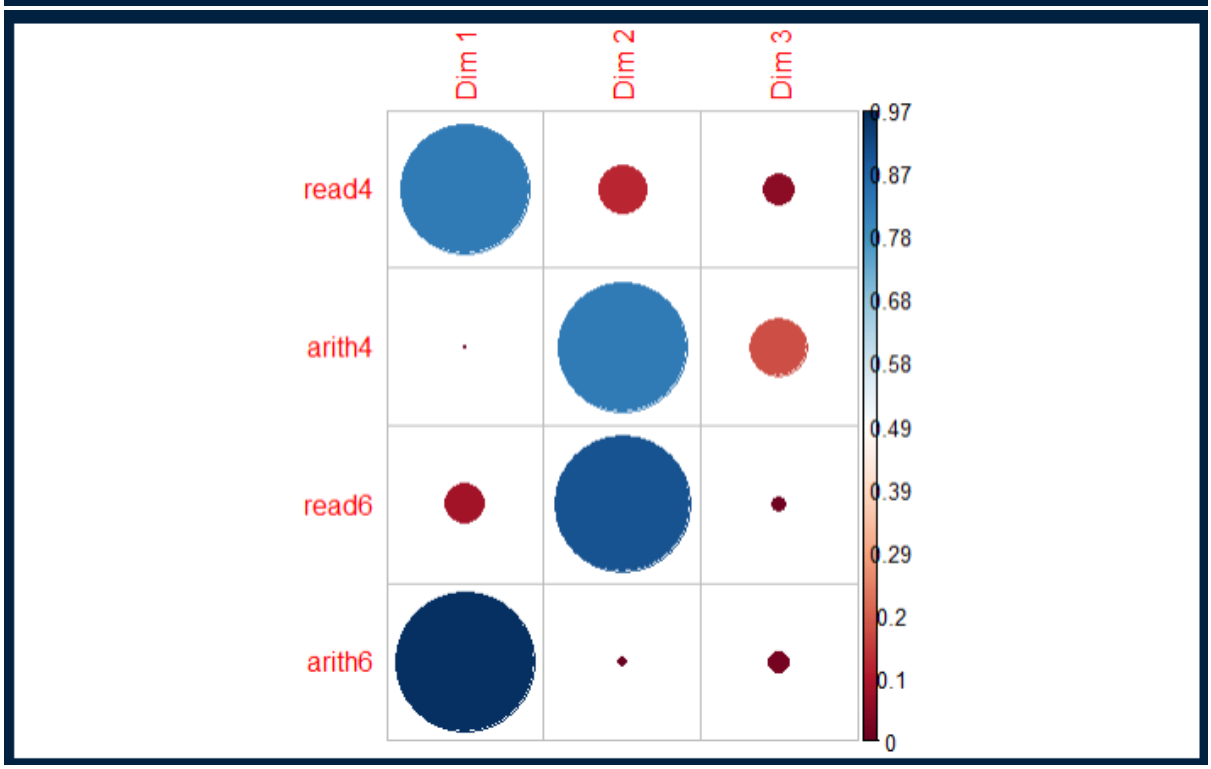
```
# Visual Row Variables
# Coord
fviz_ca_col(ach.ca, col.col = "coord", gradient.cols =
c("#00AFBB", "#E7B800", "#FC4E07"), repel = TRUE)
corrplot(ach.ca.col$coord, is.corr = FALSE)
```



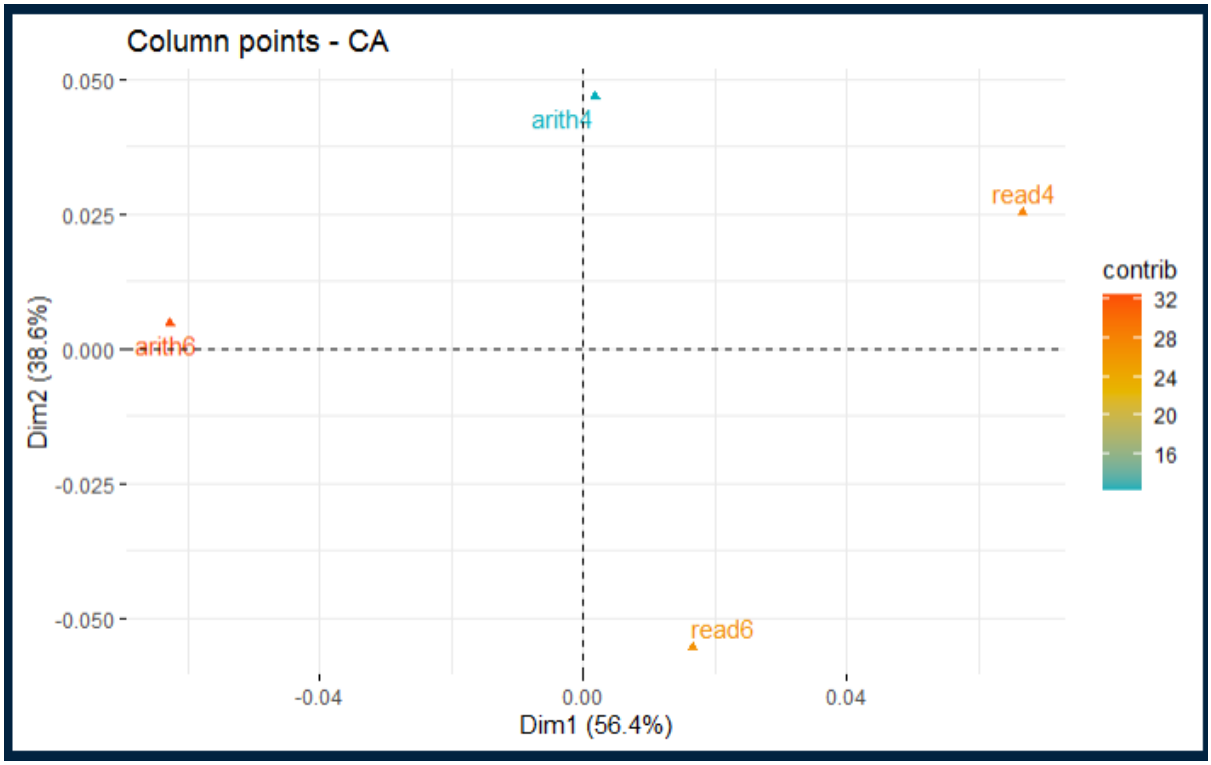


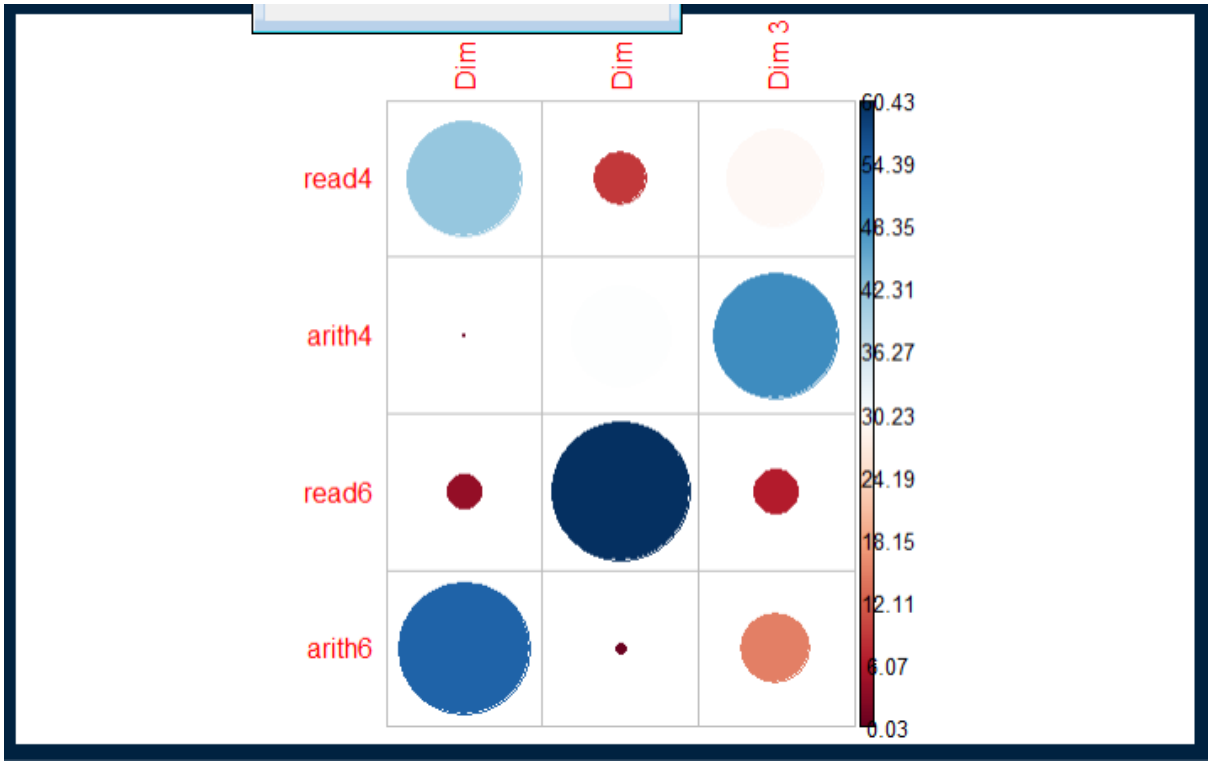

```
# Cos2
fviz_ca_col(ach.ca, col.col = "cos2", gradient.col =
c("#00AFBB", "#E7B800", "#FC4E07"), repel = TRUE)
corrplot(ach.ca.col$cos2, is.corr = FALSE)
```



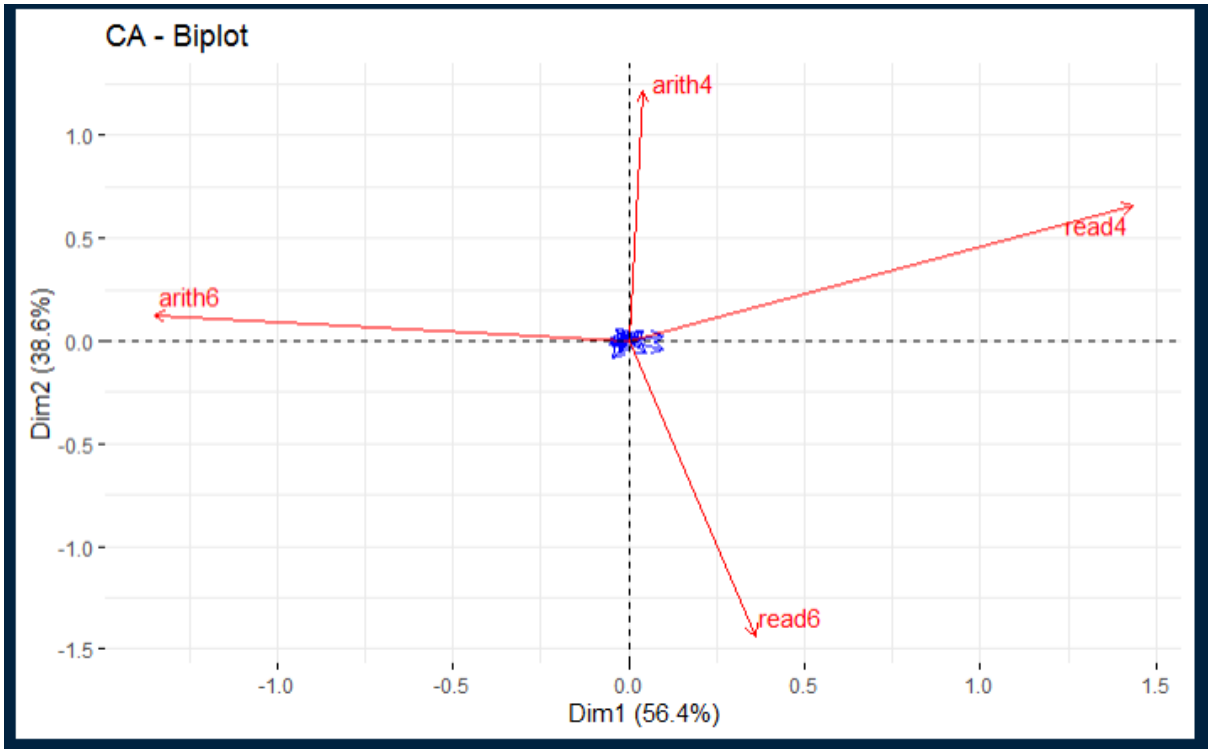



```
#Contrib
fviz_ca_col(ach.ca, col.col = "contrib", gradient.col =
c("#00AFBB", "#E7B800", "#FC4E07"), repel = TRUE)
corrplot(ach.ca.col$contrib, is.corr = FALSE)
```

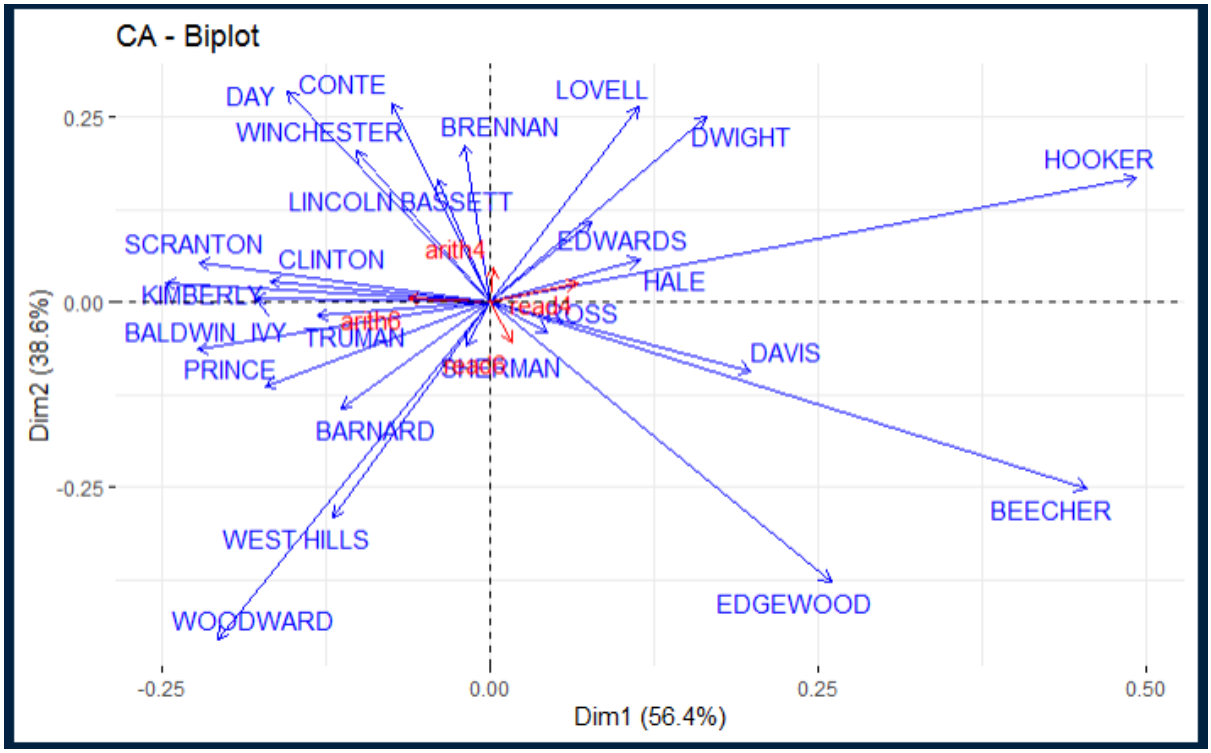





```{R}
# Biplot Options
# Asymmetric Biplot
fviz_ca_biplot(ach.ca, map ="rowprincipal", arrow = c(TRUE, TRUE), repel = TRUE)
```




```
#Contribution Biplot
fviz_ca_biplot(ach.ca, map = "colgreen", arrow = c(TRUE,
TRUE), repel = TRUE)
```



```{R}
#Dimension Description
ach.desc <- dimdesc(ach.ca, axes = c(1, 2))
ach.desc
```

```
$`Dim 1`
$`Dim 1`$row
                      coord
KIMBERLY        -0.061684886
BALDWIN         -0.056622550
SCRANTON        -0.055474992
IVY             -0.044591210
WOODWARD        -0.044475685
PRINCE          -0.043061529
CLINTON         -0.039364380
DAY             -0.039069033
TRUMAN          -0.032745107
WEST HILLS      -0.028504947
WINCHESTER      -0.025858958
BARNARD         -0.025312307
CONTE           -0.018833523
LINCOLN BASSETT -0.009837366
BRENNAN         -0.004998669
SHERMAN         -0.004236681
ROSS             0.009765888
EDWARDS          0.017826622
HALE             0.025641860
LOVELL           0.025797366
DWIGHT           0.039391149
DAVIS            0.042060572
EDGEWOOD         0.051149103
BEECHER          0.097619028
HOOKER           0.099238985

$`Dim 1`$col
              coord
arith6 -0.062735092
arith4  0.001778934
read6   0.016728798
read4   0.066715555
```

```
$`Dim 2`
$`Dim 2`$row
                      coord
WOODWARD        -0.080536888
EDGEWOOD        -0.061551912
WEST HILLS      -0.057371716
BEECHER         -0.044697046
BARNARD         -0.026511812
PRINCE          -0.023731963
DAVIS           -0.016284684
BALDWIN         -0.013584907
SHERMAN         -0.011315346
ROSS            -0.007296770
TRUMAN          -0.003865788
IVY              0.001037968
KIMBERLY         0.005323989
CLINTON          0.005573299
HALE             0.010700213
SCRANTON         0.010984742
EDWARDS          0.020869767
HOOKER           0.027883225
LINCOLN BASSETT  0.033872955
WINCHESTER       0.042682325
BRENNAN          0.044144686
LOVELL           0.049651047
DWIGHT           0.049776092
CONTE            0.056389945
DAY              0.059474858

$`Dim 2`$col
              coord
read6  -0.05531941
arith6  0.00477978
read4   0.02539299
arith4  0.04671458
```

```{R}
# Dataset 2
# Preparation
library(flexclust)
library(FactoMineR)
library(factoextra)
library(corrplot)
# CA
data("VADeaths")
va.ca <- CA(VADeaths, graph = FALSE)
va.ca
```

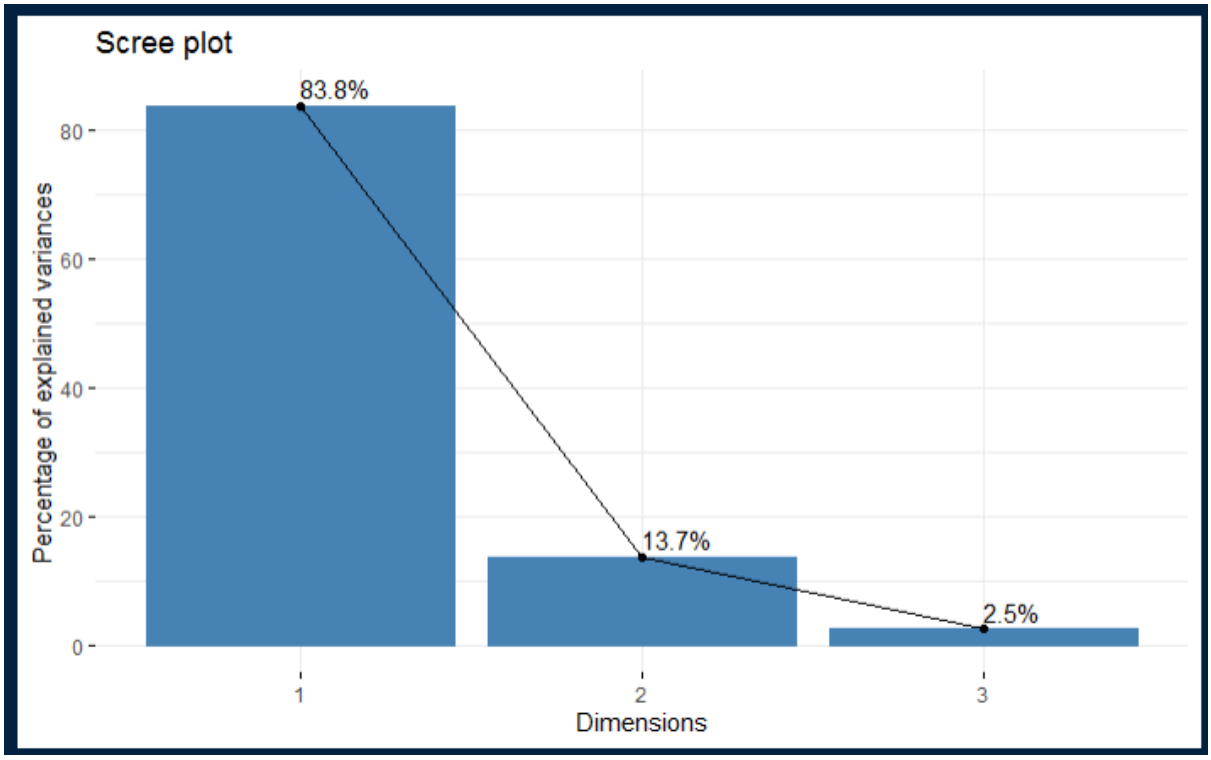
```
**Results of the Correspondence Analysis (CA)**
The row variable has  5  categories; the column variable has 4 categories
The chi square of independence between the two variables is equal to 2.920833 (p-value =  0.9960776 ).
*The results are available in the following objects:

   name              description
1  "$eig"            "eigenvalues"
2  "$col"            "results for the columns"
3  "$col$coord"      "coord. for the columns"
4  "$col$cos2"       "cos2 for the columns"
5  "$col$contrib"    "contributions of the columns"
6  "$row"            "results for the rows"
7  "$row$coord"      "coord. for the rows"
8  "$row$cos2"       "cos2 for the rows"
9  "$row$contrib"    "contributions of the rows"
10 "$call"           "summary called parameters"
11 "$call$marge.col" "weights of the columns"
12 "$call$marge.row" "weights of the rows"
```

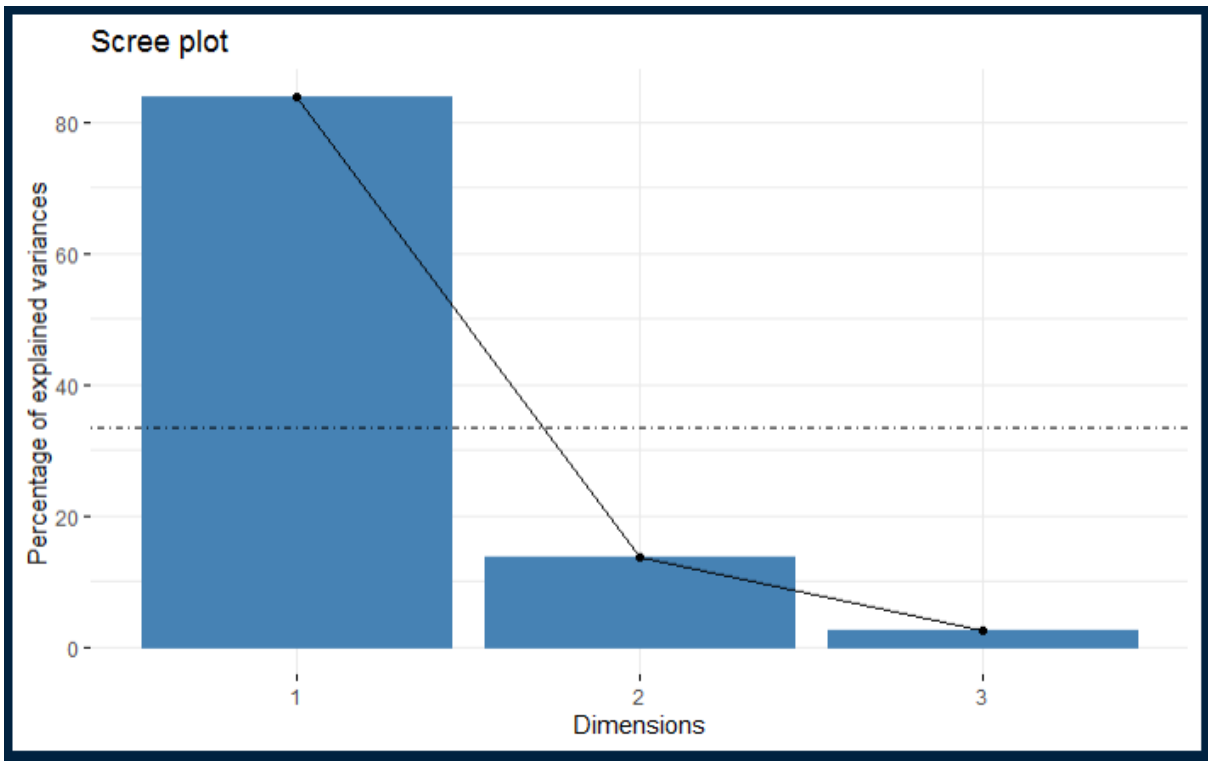
```{R}
# Statistical Significance
# Chi
Chi2 <- 1502.556

# Degree of Freedom
DF2<- (1/(nrow(VADeaths)-1))*100
DF2
DF2.1 <- (1/(ncol(VADeaths)-1))*100
DF2.1

#P-Value
PVal2 <- pchisq(Chi2, df = DF2, lower.tail = FALSE)
PVal2
```

```
[1] 25
[1] 33.33333
[1] 4.637505e-302
```

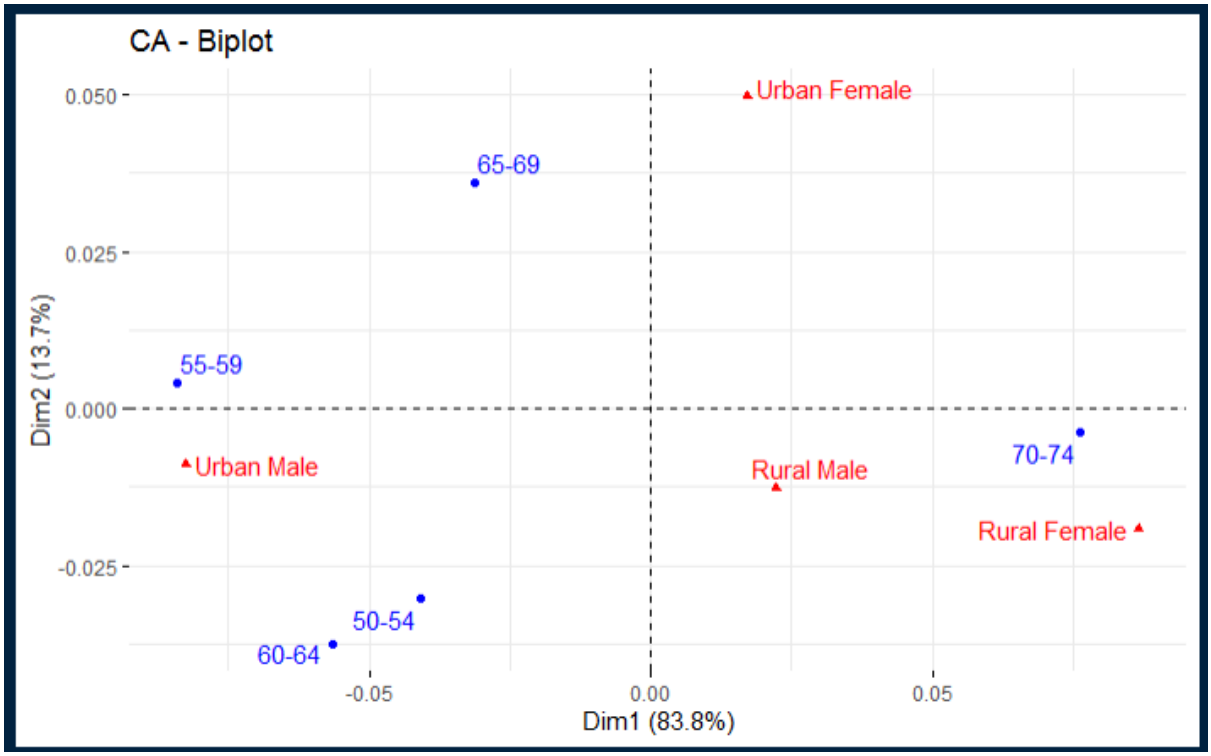
```{R}
# EigenValues & Variances
va.ca.eig <- va.ca$eig
va.ca.eig
fviz_screeplot(va.ca, addlabels = TRUE, ylim = c(0, 85))
fviz_screeplot(va.ca)+geom_hline(yintercept = DF2.1, linetype
= 4, color = "black")
```

```
       eigenvalue percentage of variance cumulative percentage of variance
dim 1 0.0039559622                83.75581                           83.75581
dim 2 0.0006488287                13.73703                           97.49284
dim 3 0.0001184184                 2.50716                          100.00000
```





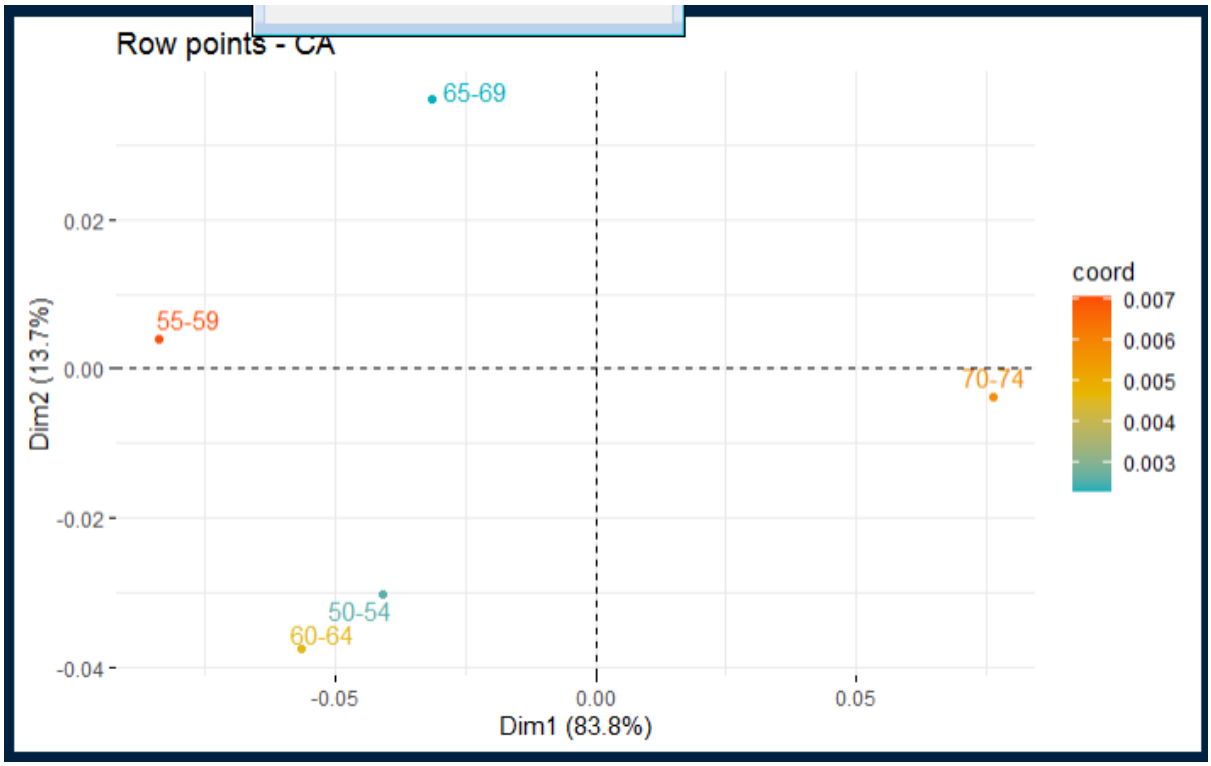

```{R}
# biplot
fviz_ca_biplot(va.ca, repel = TRUE)
```

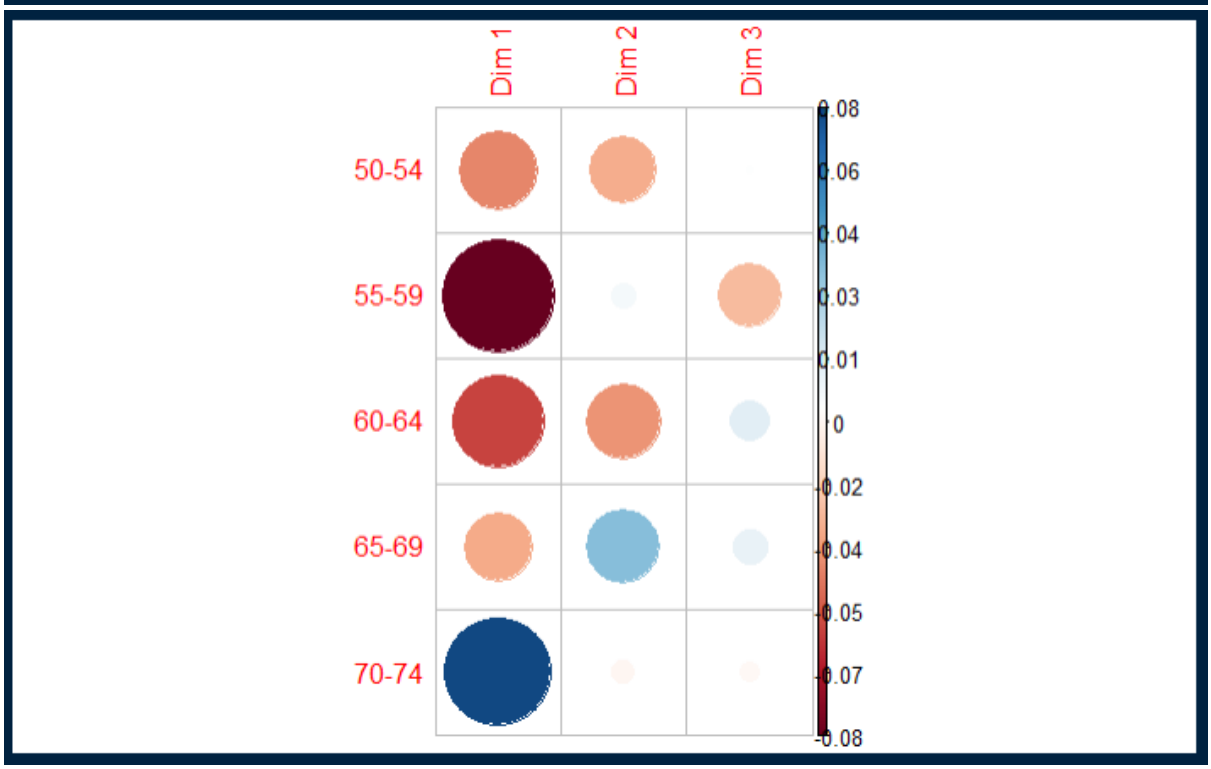



```{R}
# Graph of Row Variable
va.ca.row <- va.ca$row
va.ca.row
```

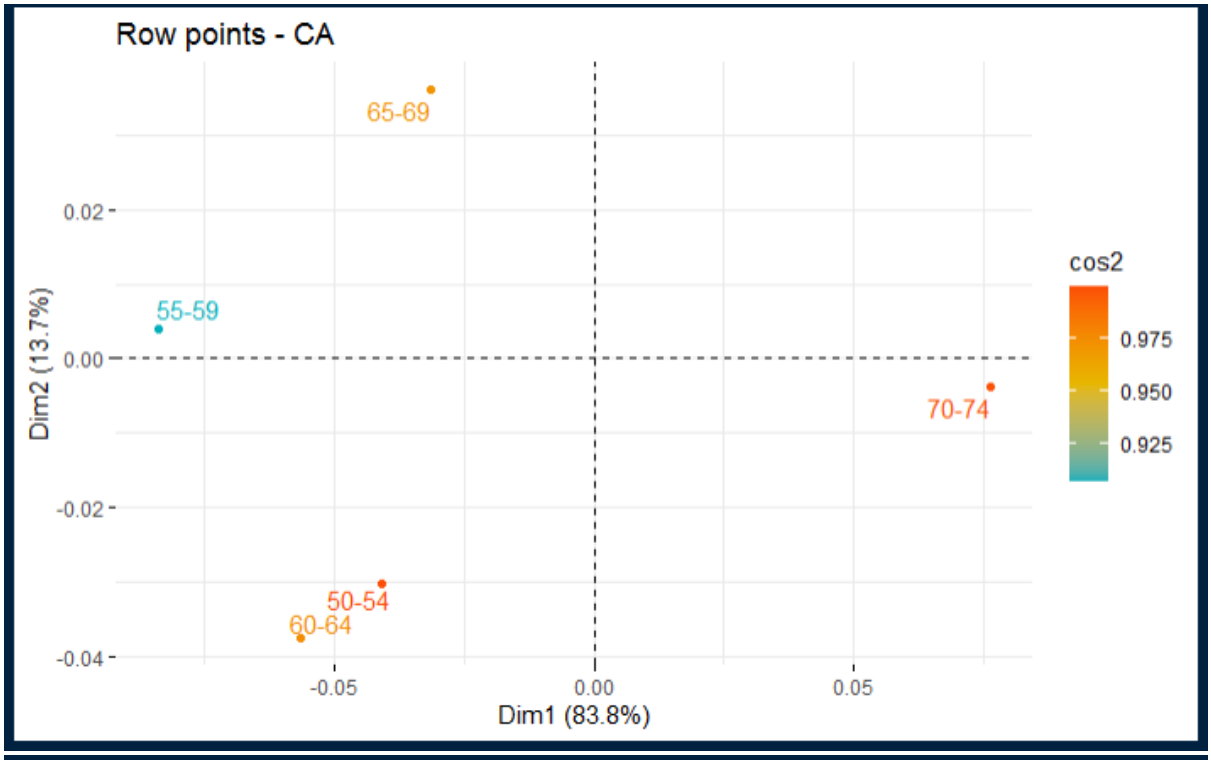
```
$coord
           Dim 1        Dim 2         Dim 3
50-54 -0.04097107 -0.030270382  0.0003386103
55-59 -0.08400712  0.004072713 -0.0268644131
60-64 -0.05651914 -0.037503746  0.0107935658
65-69 -0.03135916  0.036112224  0.0081292483
70-74  0.07628656 -0.003694571 -0.0025976238

$contrib
         Dim 1      Dim 2        Dim 3
50-54  3.03288 10.0938900  0.006920441
55-59 19.52987  0.2798703 66.719776548
60-64 13.51480 36.2819109 16.465746898
65-69  6.49604 52.5230970 14.583217027
70-74 57.42641  0.8212319  2.224339087

$cos2
          Dim 1       Dim 2        Dim 3
50-54 0.6468605 0.353095279 4.418312e-05
55-59 0.9052934 0.002127770 9.257886e-02
60-64 0.6771489 0.298155254 2.469580e-02
65-69 0.4178313 0.554090268 2.807843e-02
70-74 0.9965073 0.002337289 1.155412e-03

$inertia
[1] 0.0001854798 0.0008534185 0.0007895465 0.0006150350 0.0022797295
```

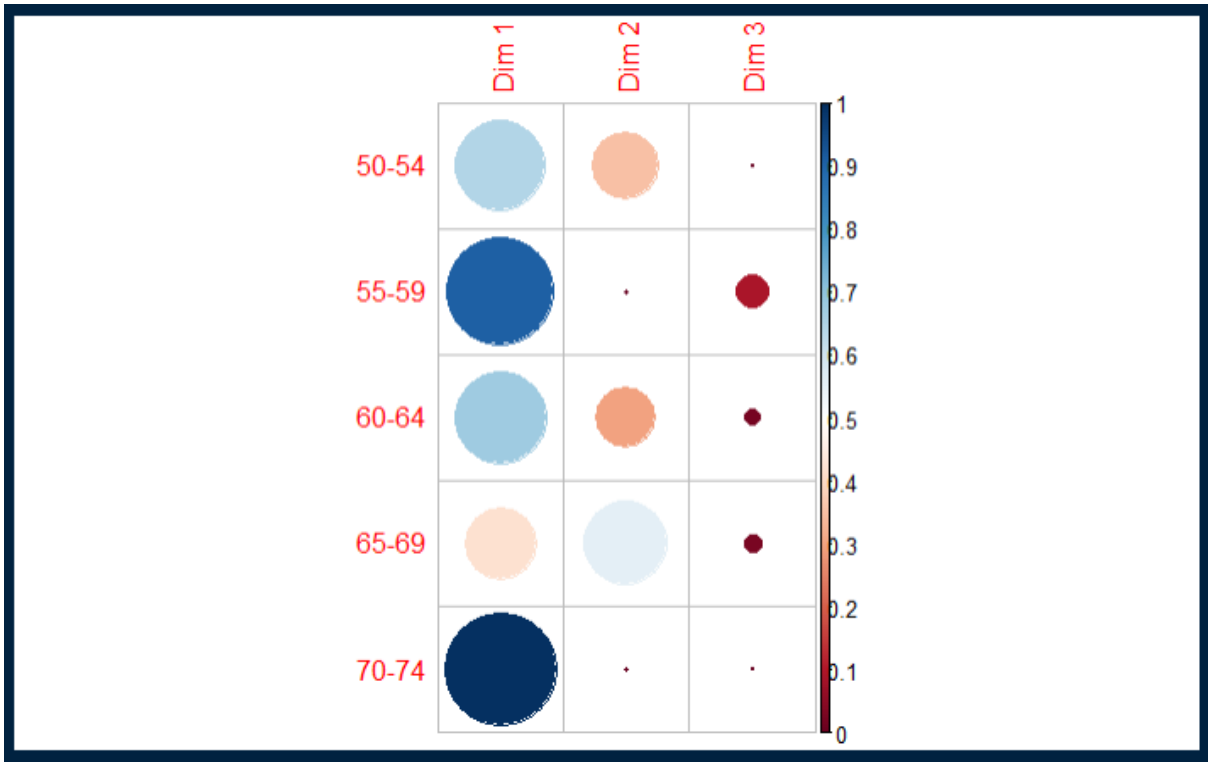
```
# Visual Row Variables
# Coord
fviz_ca_row(va.ca, col.row = "coord", gradient.cols =
c("#00AFBB", "#E7B800", "#FC4E07"), repel = TRUE)
corrplot(va.ca.row$coord, is.corr = FALSE)
```



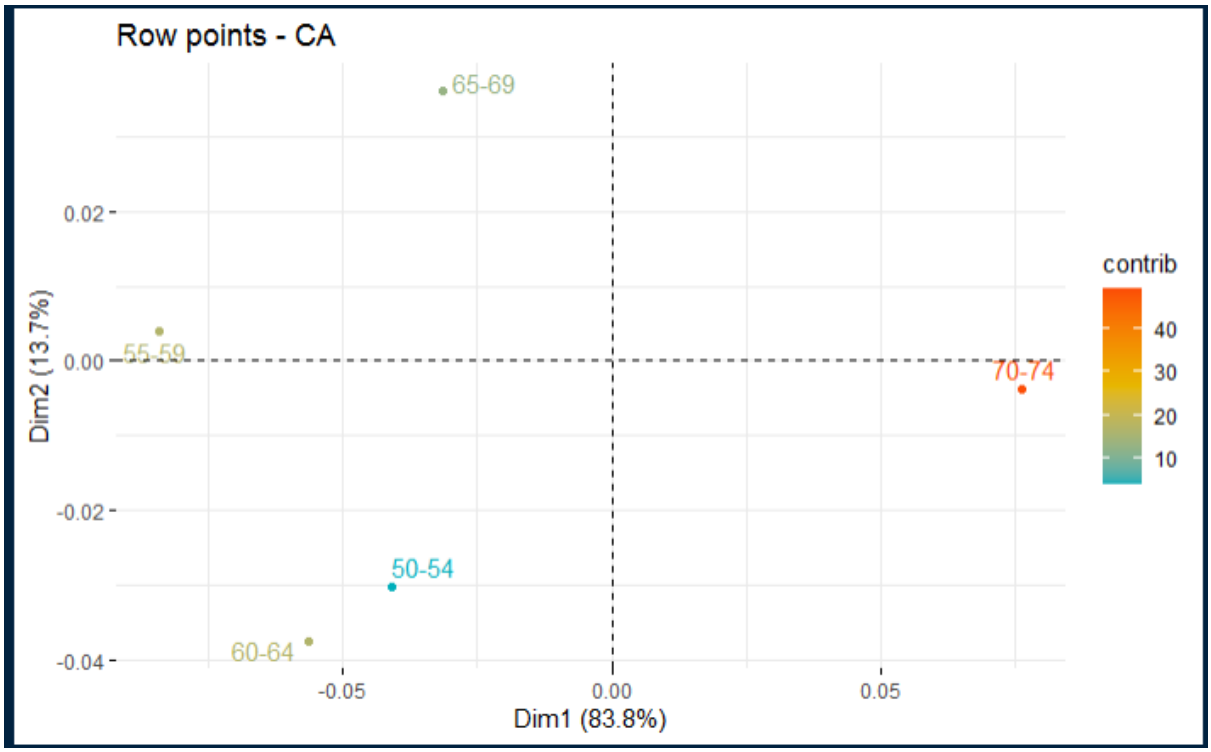


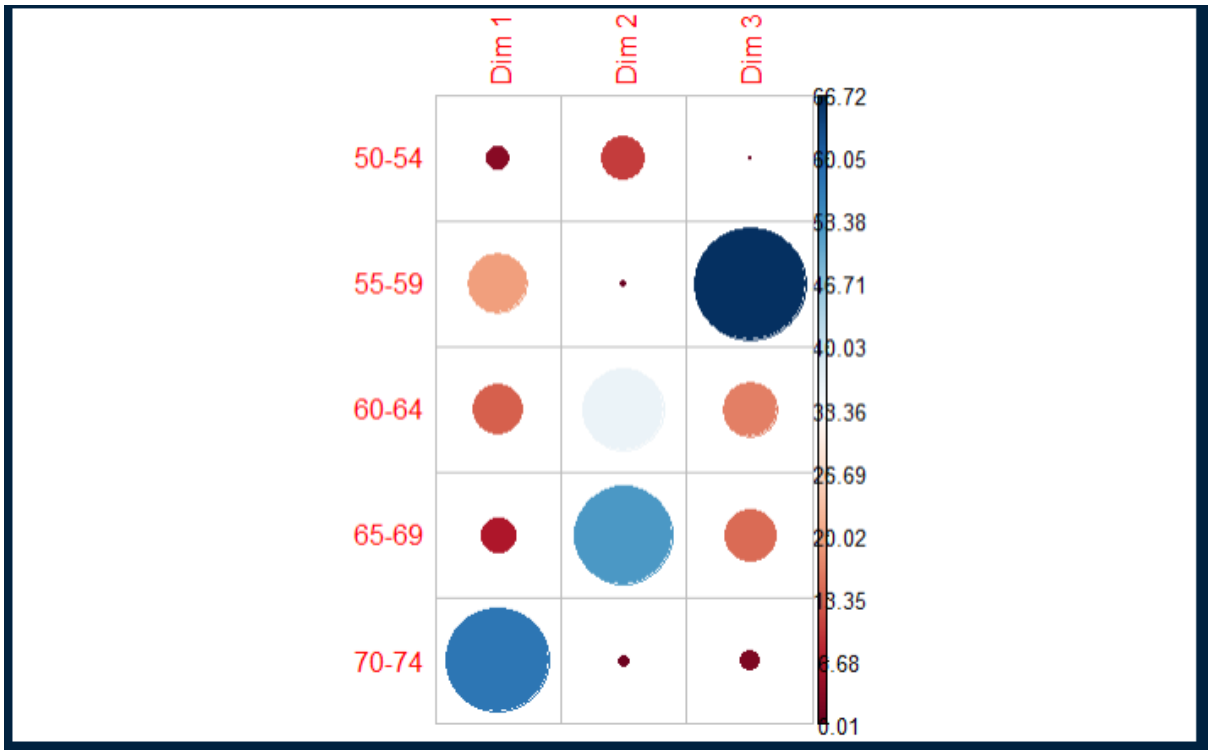
```
# Cos2
fviz_ca_row(va.ca, col.row = "cos2", gradient.col =
c("#00AFBB", "#E7B800", "#FC4E07"), repel = TRUE)
corrplot(va.ca.row$cos2, is.corr = FALSE)
```





```
#Contrib
fviz_ca_row(va.ca, col.row = "contrib", gradient.col =
c("#00AFBB", "#E7B800", "#FC4E07"), repel = TRUE)
corrplot(va.ca.row$contrib, is.corr = FALSE)
```

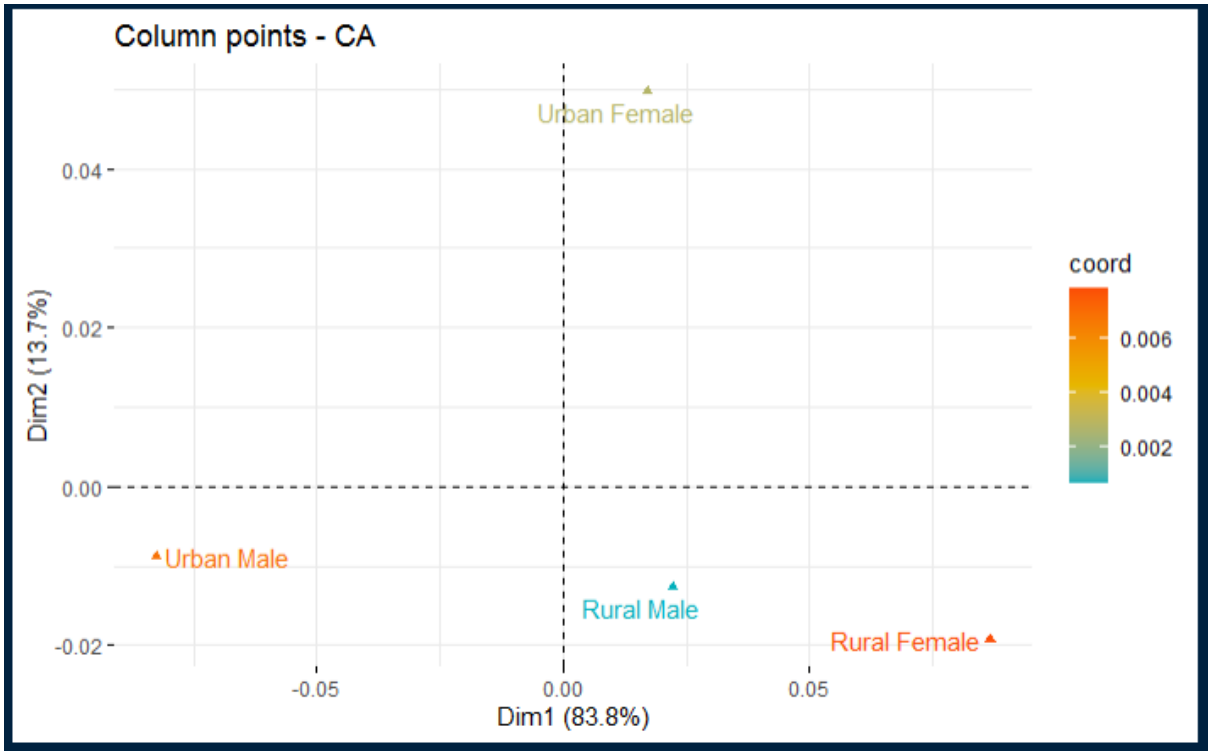


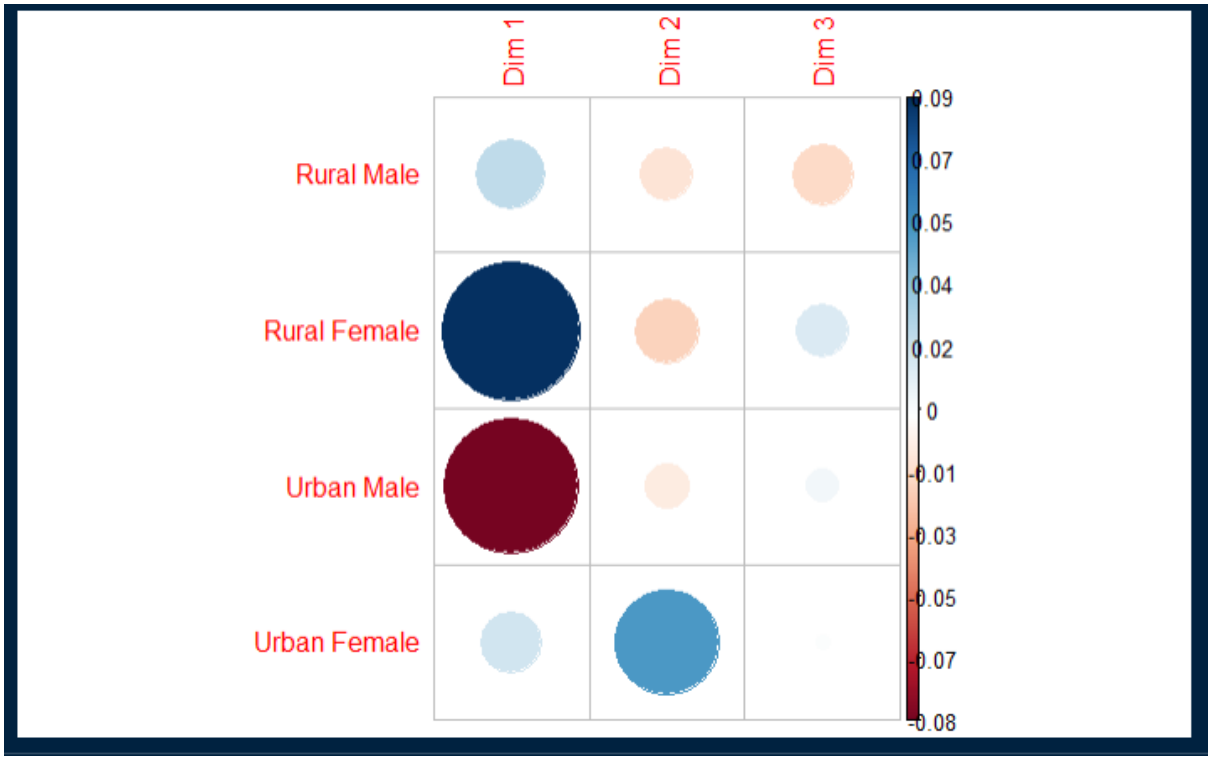


```{R}
# Graph of Column Variables
va.ca.col <- va.ca$col
va.ca.col
```

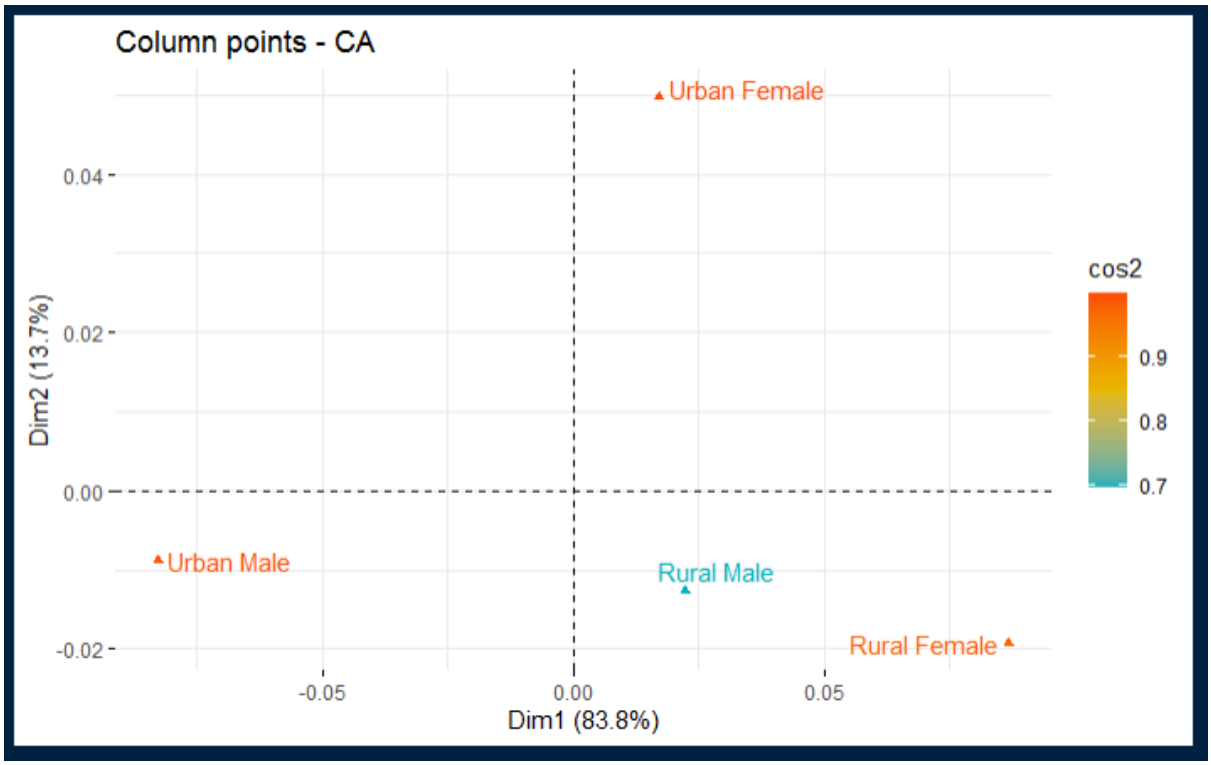
```
$coord
                 Dim 1        Dim 2         Dim 3
Rural Male    0.02223471 -0.012599844 -0.0168863955
Rural Female  0.08671816 -0.019262951  0.0130539049
Urban Male   -0.08261995 -0.008882095  0.0049657618
Urban Female  0.01712530  0.049727341  0.0009157129

$contrib
                 Dim 1     Dim 2      Dim 3
Rural Male    3.308187  6.477083 63.7431899
Rural Female 38.701182 11.643187 29.2966404
Urban Male   56.475320  3.979622  6.8154335
Urban Female  1.515312 77.900107  0.1447361

$cos2
                 Dim 1      Dim 2        Dim 3
Rural Male   0.5268979 0.16919743 0.3039046671
Rural Female 0.9328332 0.04602879 0.0211380423
Urban Male   0.9850568 0.01138472 0.0035584695
Urban Female 0.1059935 0.89370340 0.0003030551

$inertia
[1] 0.0002483795 0.0016412411 0.0022680340 0.0005655548
```

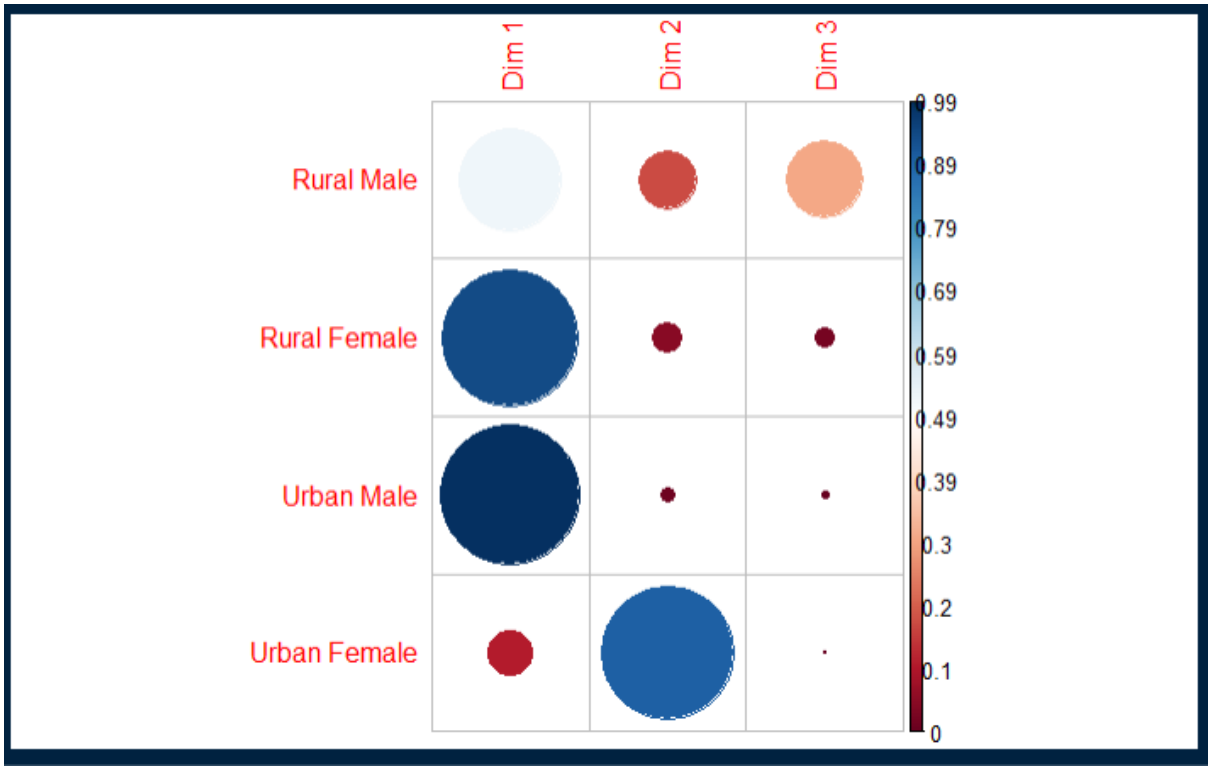
```
# Visual Row Variables
# Coord
fviz_ca_col(va.ca, col.col = "coord", gradient.cols =
c("#00AFBB", "#E7B800", "#FC4E07"), repel = TRUE)
corrplot(va.ca.col$coord, is.corr = FALSE)
```



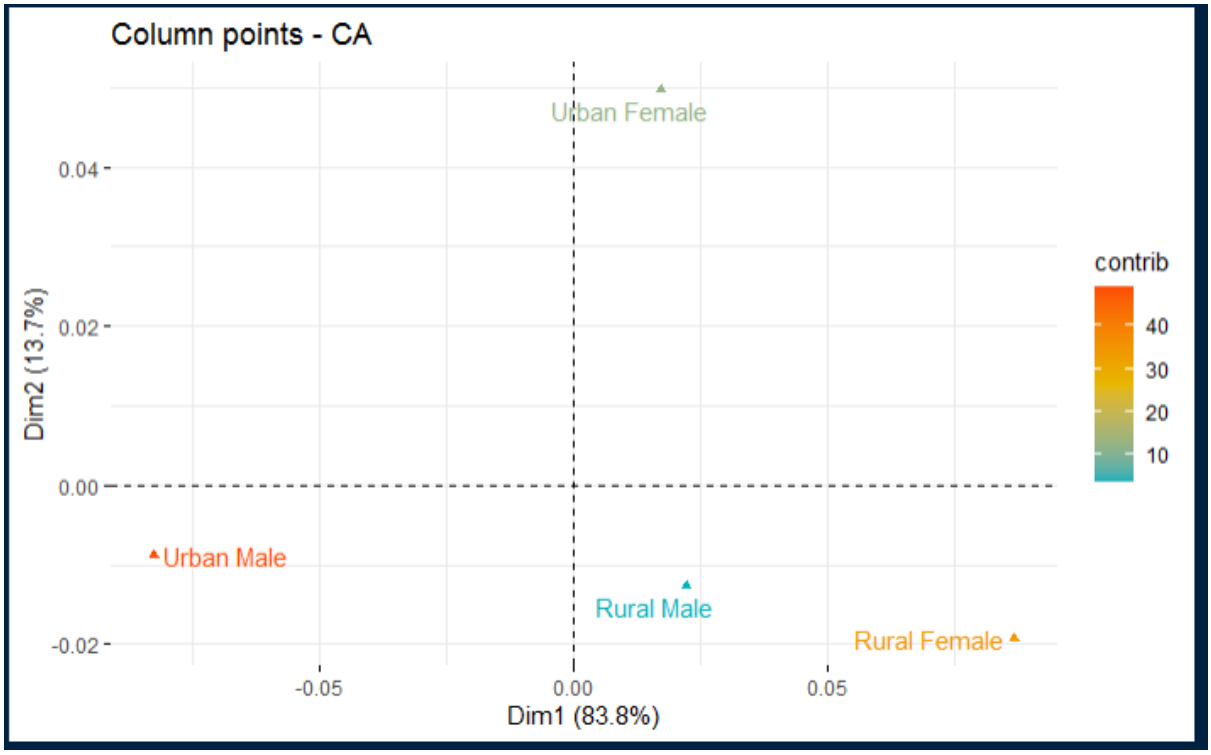


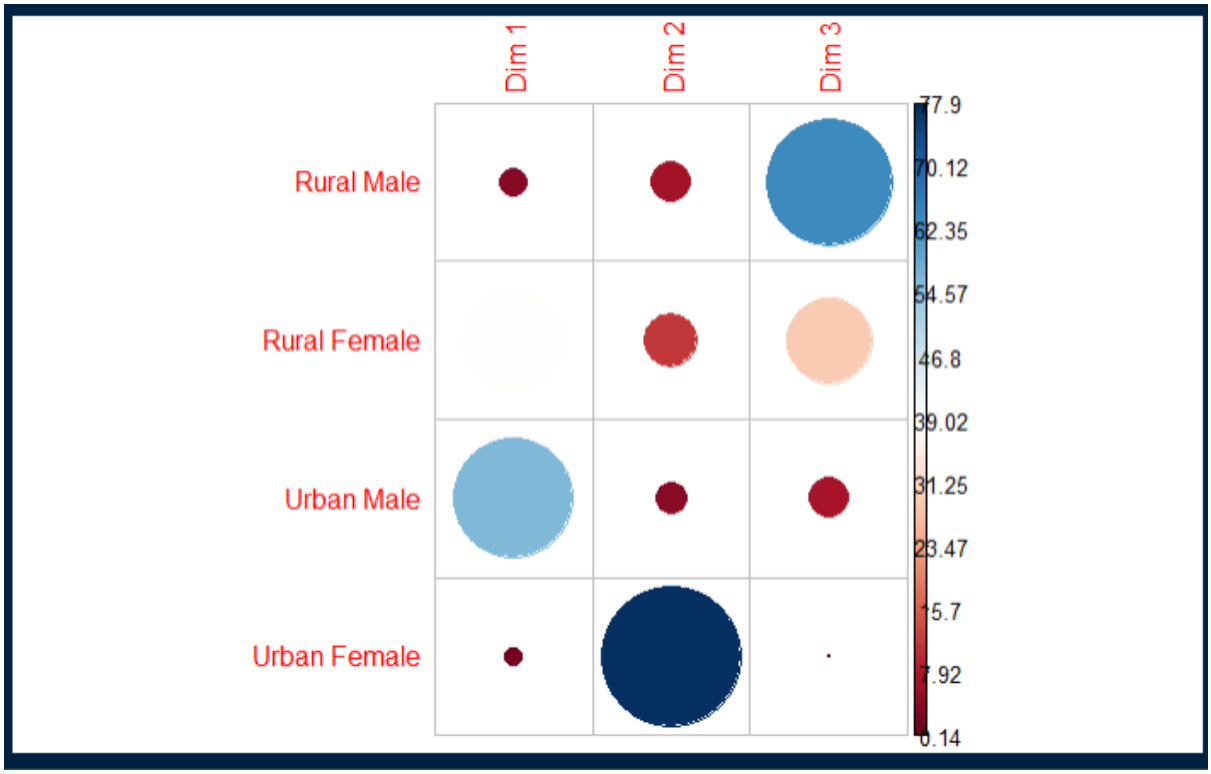

```
# Cos2
fviz_ca_col(va.ca, col.col = "cos2", gradient.col =
c("#00AFBB", "#E7B800", "#FC4E07"), repel = TRUE)
corrplot(va.ca.col$cos2, is.corr = FALSE)
```



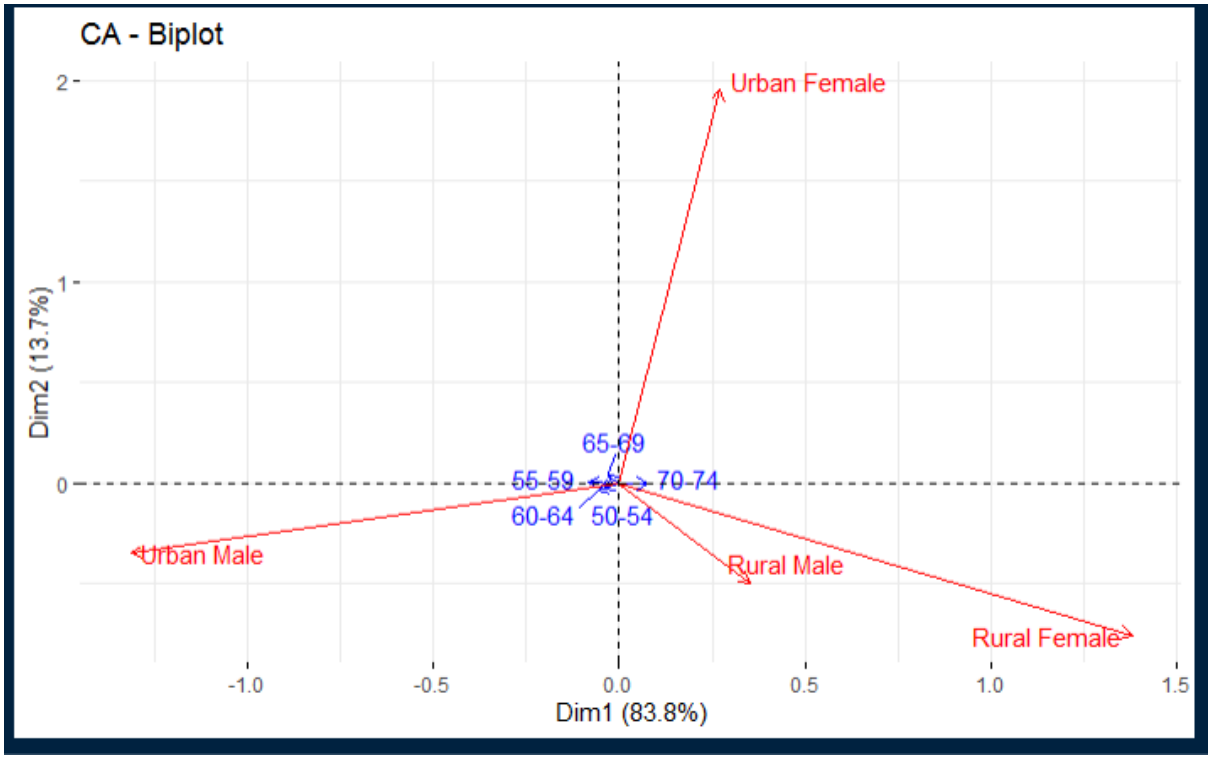



```
#Contrib
fviz_ca_col(va.ca, col.col = "contrib", gradient.col =
c("#00AFBB", "#E7B800", "#FC4E07"), repel = TRUE)
corrplot(va.ca.col$contrib, is.corr = FALSE)
```

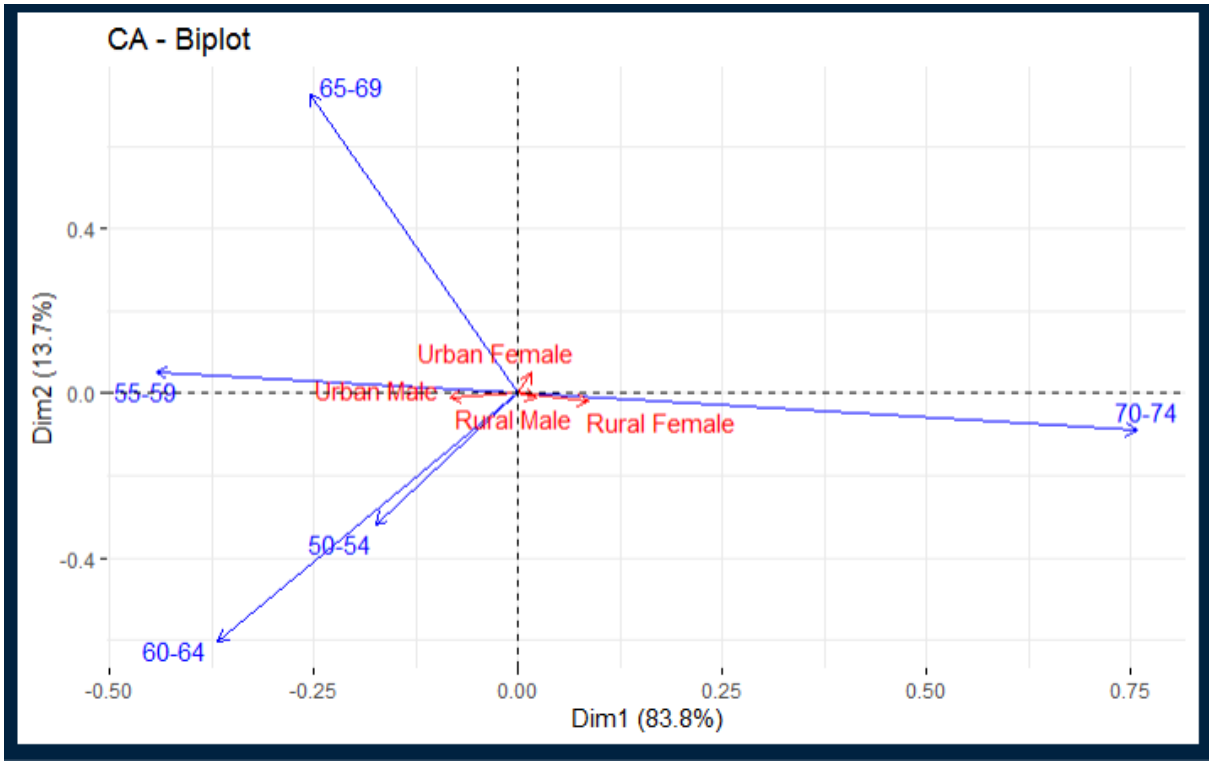





```{R}
# Biplot Options
# Asymmetric Biplot
fviz_ca_biplot(va.ca, map ="rowprincipal", arrow = c(TRUE, TRUE), repel = TRUE)
```



```
#Contribution Biplot
fviz_ca_biplot(va.ca, map = "colgreen", arrow = c(TRUE, TRUE),
repel = TRUE)
```




```{R}
#Dimension Description
va.desc <- dimdesc(va.ca, axes = c(1, 2))
va.desc
```

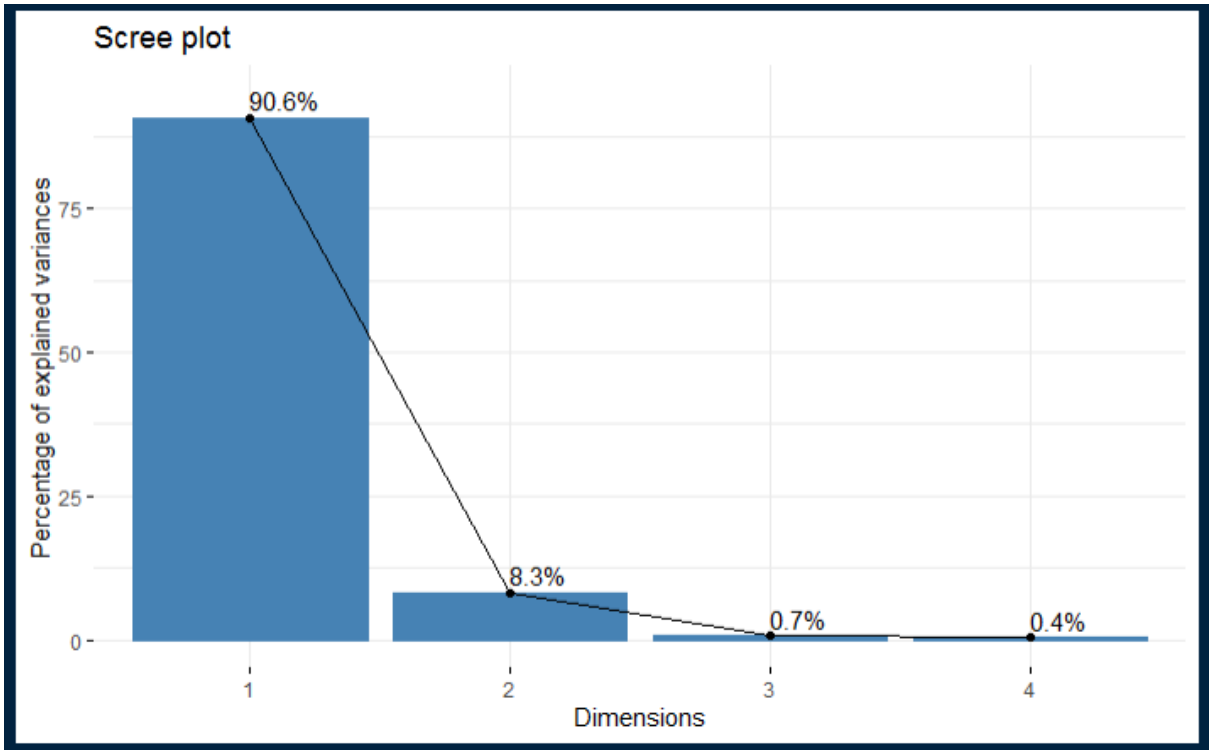
```
$`Dim 1`
$`Dim 1`$row
          coord
55-59 -0.08400712
60-64 -0.05651914
50-54 -0.04097107
65-69 -0.03135916
70-74  0.07628656

$`Dim 1`$col
                  coord
Urban Male   -0.08261995
Urban Female  0.01712530
Rural Male    0.02223471
Rural Female  0.08671816


$`Dim 2`
$`Dim 2`$row
          coord
60-64 -0.037503746
50-54 -0.030270382
70-74 -0.003694571
55-59  0.004072713
65-69  0.036112224

$`Dim 2`$col
                  coord
Rural Female -0.019262951
Rural Male   -0.012599844
Urban Male   -0.008882095
Urban Female  0.049727341
```

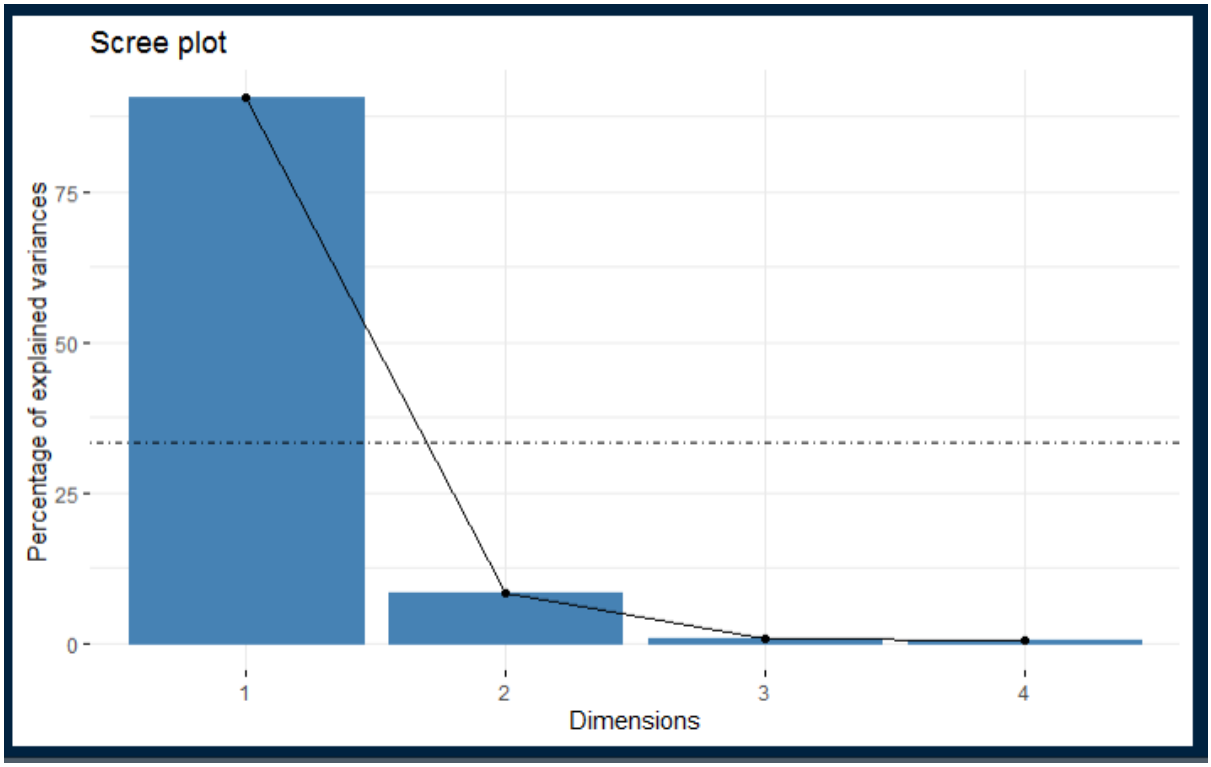
```{R}
# Dataset 3
# Statistical Significance
# Chi
Chi3 <- 2198.241

# Degree of Freedom
DF3 <- (1/(nrow(housetasks)-1))*100
DF3
DF3.1 <- (1/(ncol(housetasks)-1))*100
DF3.1

#P-Value
PVal3 <- pchisq(Chi3, df = DF3, lower.tail = FALSE)
PVal3
```

```
[1] 8.333333
[1] 33.33333
[1] 0
```

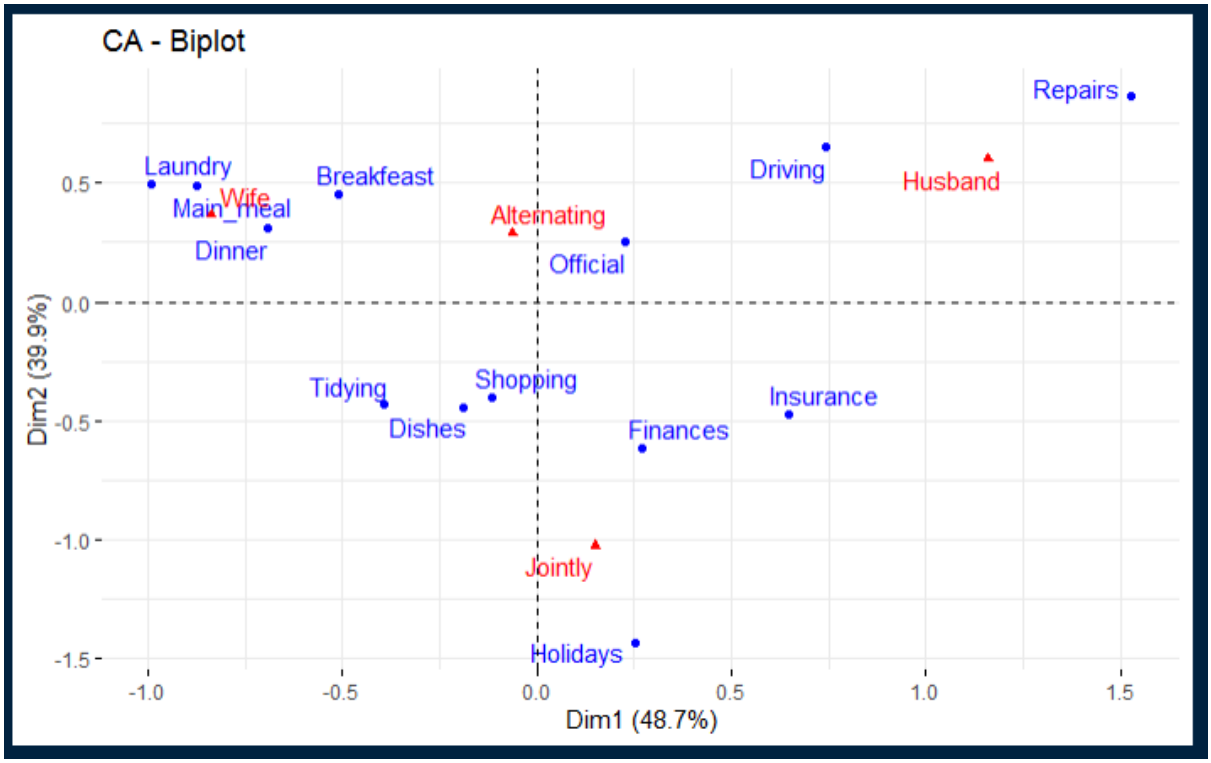
```{R}
# EigenValues & Variances
ht.ca.eig <- ht.ca$eig
ht.ca.eig
fviz_screeplot(ht.ca, addlabels = TRUE, ylim = c(0, 95))
fviz_screeplot(ht.ca)+geom_hline(yintercept = DF3.1, linetype
= 4, color = "black")
```

	eigenvalue	percentage of variance	cumulative percentage of variance
dim 1	0.1425000353	90.5737510	90.57375
dim 2	0.0130461217	8.2921816	98.86593
dim 3	0.0011170958	0.7100318	99.57596
dim 4	0.0006671368	0.4240356	100.00000





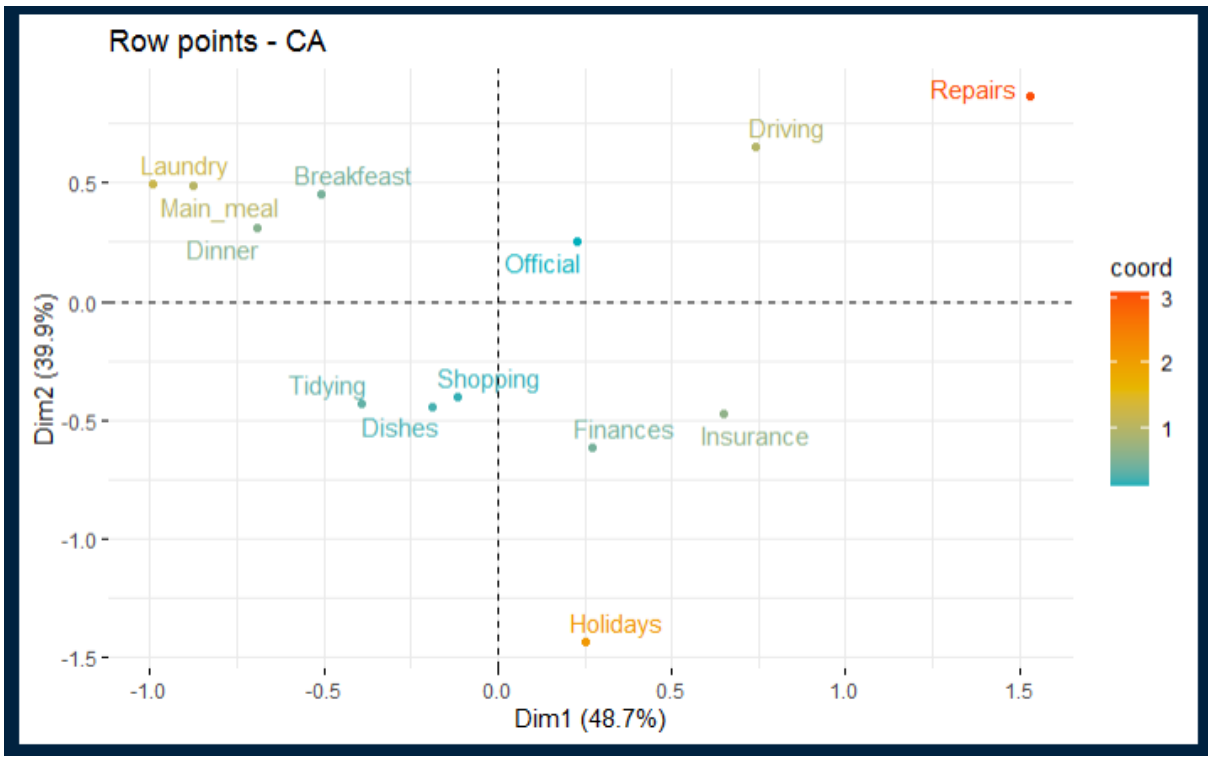

```{R}
# biplot
fviz_ca_biplot(ht.ca, repel = TRUE)
```

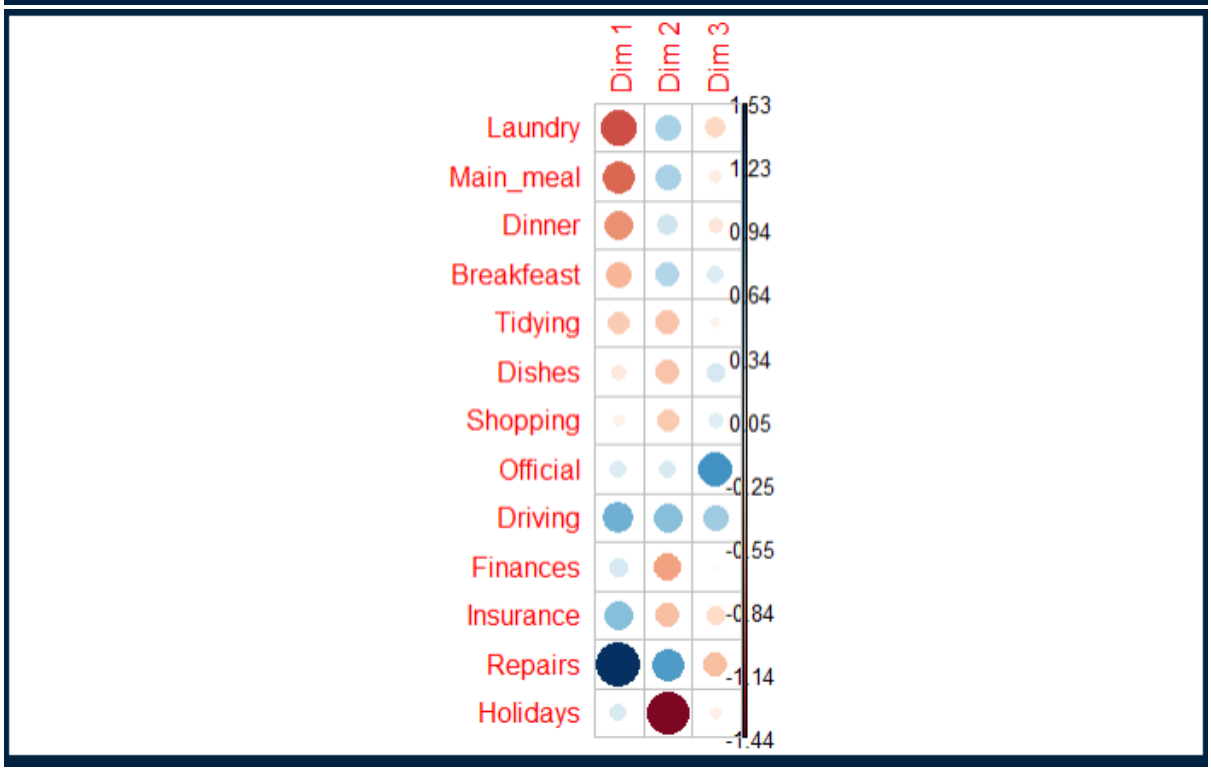



```{R}
# Graph of Row Variable
ht.ca.row <- ht.ca$row
ht.ca.row
```

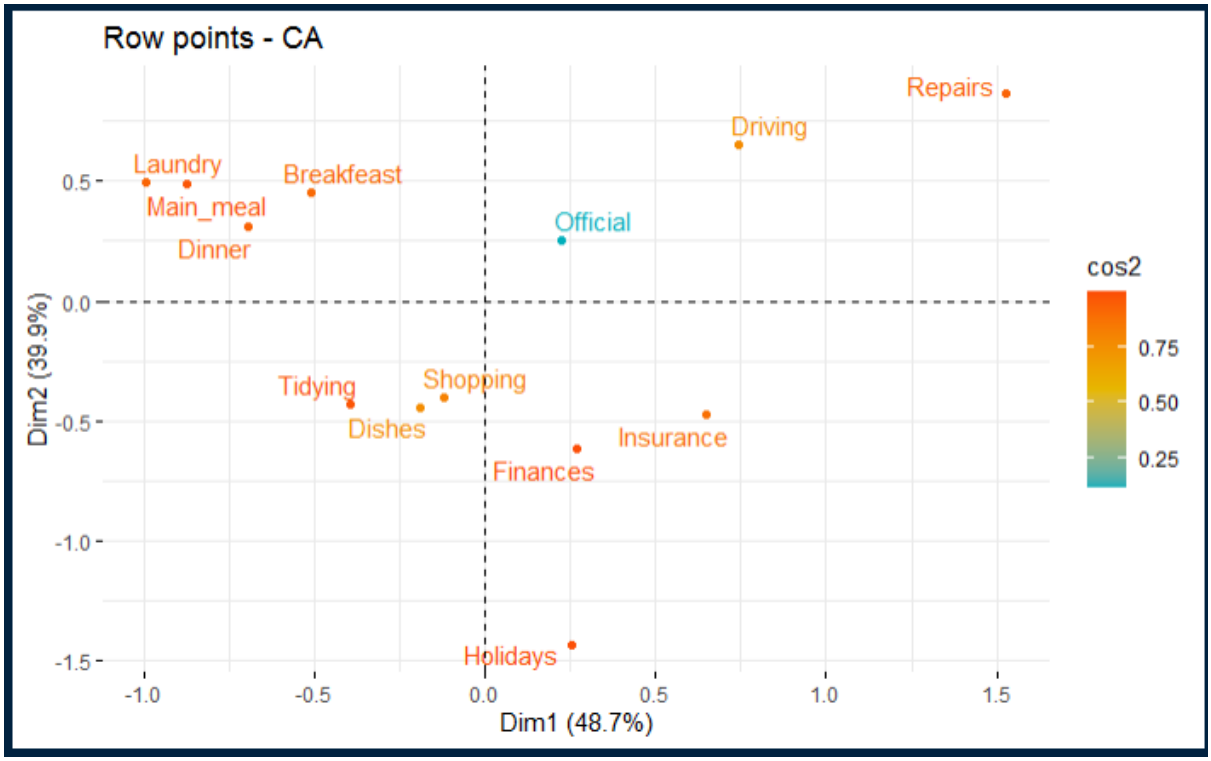
```
$coord
               Dim 1      Dim 2       Dim 3
Laundry    -0.9918368  0.4953220 -0.31672897
Main_meal  -0.8755855  0.4901092 -0.16406487
Dinner     -0.6925740  0.3081043 -0.20741377
Breakfeast -0.5086002  0.4528038  0.22040453
Tidying    -0.3938084 -0.4343444 -0.09421375
Dishes     -0.1889641 -0.4419662  0.26694926
Shopping   -0.1176813 -0.4033171  0.20261512
Official    0.2266324  0.2536132  0.92336416
Driving     0.7417696  0.6534143  0.54445849
Finances    0.2707669 -0.6178684  0.03479681
Insurance   0.6470759 -0.4737832 -0.28936051
Repairs     1.5287787  0.8642647 -0.47208778
Holidays    0.2524863 -1.4350066 -0.12958665

$contrib
               Dim 1      Dim 2       Dim 3
Laundry    18.2867003  5.5638913  7.96842443
Main_meal  12.3888433  4.7355230  1.85868941
Dinner      5.4713982  1.3210221  2.09692603
Breakfeast  3.8249284  3.6986131  3.06939857
Tidying     1.9983518  2.9656441  0.48873403
Dishes      0.4261663  2.8441170  3.63429434
Shopping    0.1755248  2.5151584  2.22335679
Official    0.5207837  0.7956201 36.94038942
Driving     8.0778371  7.6468564 18.59638635
Finances    0.8750075  5.5585460  0.06175066
Insurance   6.1470616  4.0203590  5.25263863
Repairs    40.7300940 15.8806509 16.59639139
Holidays    1.0773030 42.4539986  1.21261994

$cos2
               Dim 1      Dim 2       Dim 3
Laundry    0.73998741 0.18455213 0.075460467
Main_meal  0.74160285 0.23235928 0.026037873
Dinner     0.77664011 0.15370323 0.069656660
Breakfeast 0.50494329 0.40023001 0.094826699
Tidying    0.43981243 0.53501508 0.025172490
Dishes     0.11811778 0.64615253 0.235729693
Shopping   0.06365362 0.74765514 0.188691242
Official   0.05304464 0.06642648 0.880528877
Driving    0.43201860 0.33522911 0.232752289
Finances   0.16067678 0.83666958 0.002653634
Insurance  0.57601197 0.30880208 0.115185951
Repairs    0.70673575 0.22587147 0.067392778
Holidays   0.02979239 0.96235977 0.007847841

$inertia
 [1] 0.13415976 0.09069235 0.03824633 0.04112368 0.02466697 0.01958732 0.01497017 0.05330000 0.10150885
[10] 0.02956446 0.05793584 0.31287411 0.19631064
```

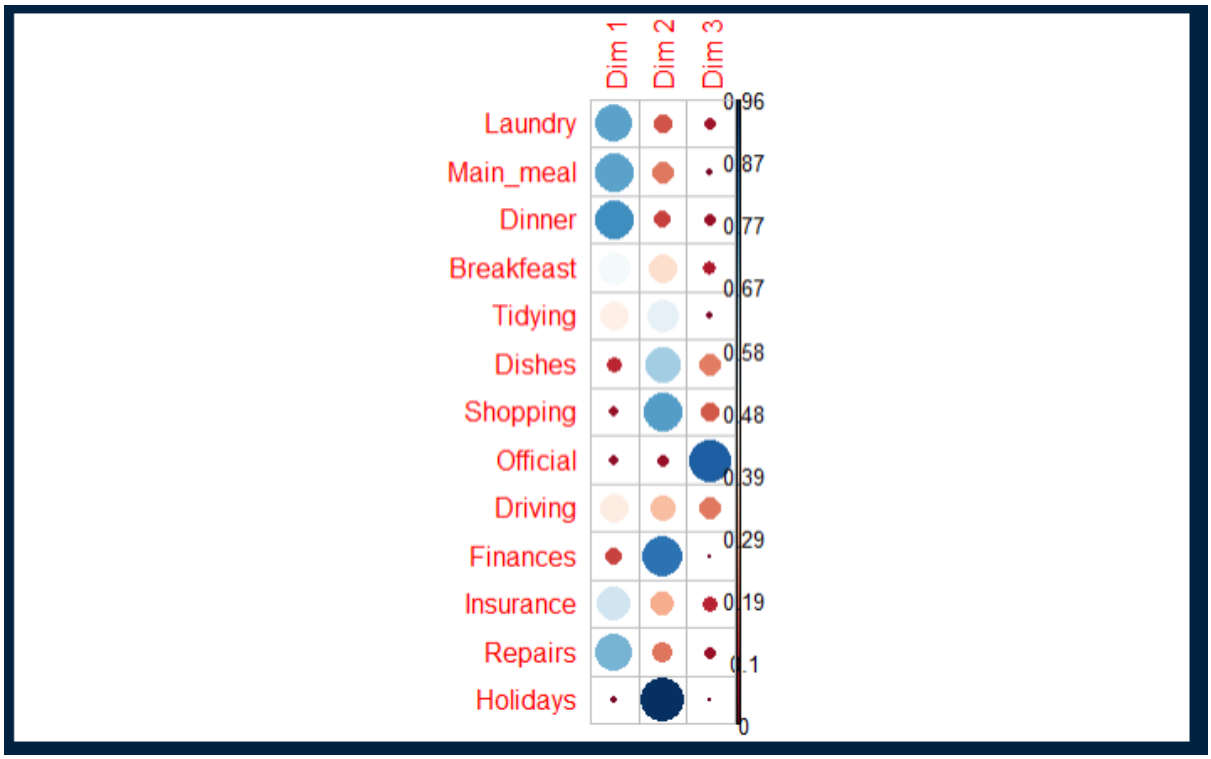
```
# Visual Row Variables
# Coord
fviz_ca_row(ht.ca, col.row = "coord", gradient.cols =
c("#00AFBB", "#E7B800", "#FC4E07"), repel = TRUE)
corrplot(ht.ca.row$coord, is.corr = FALSE)
```



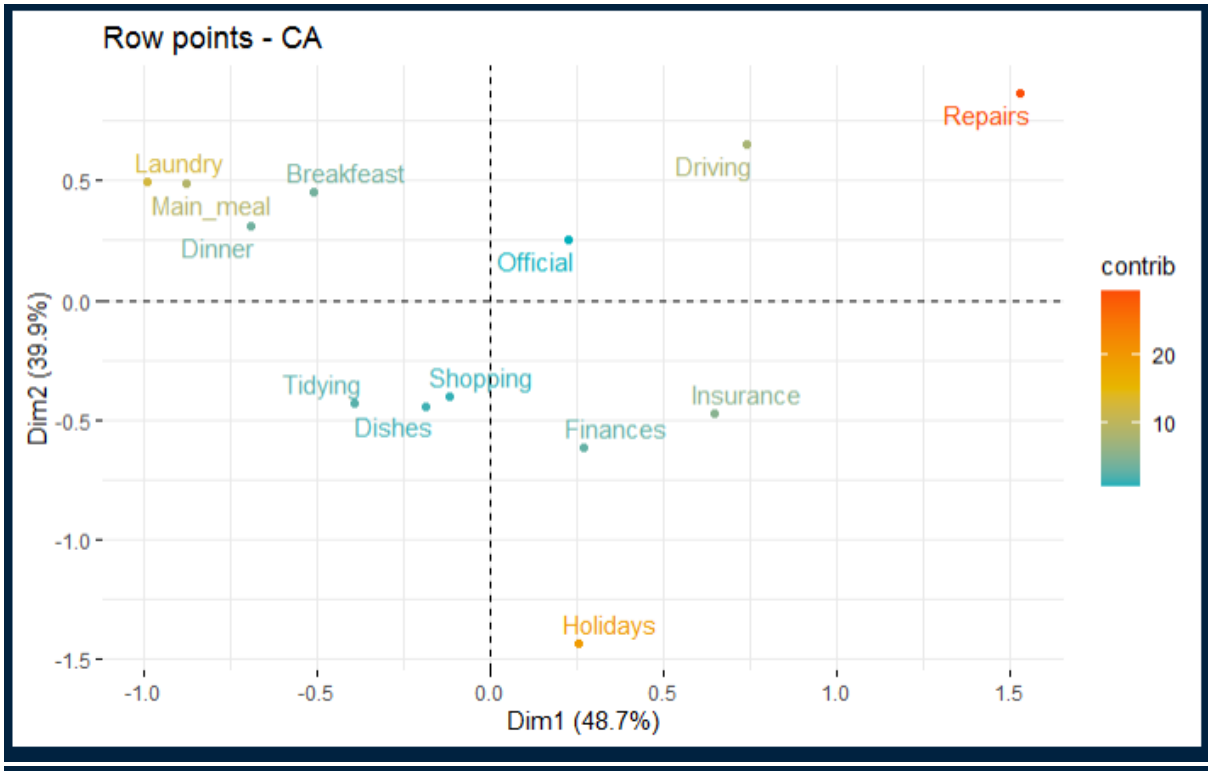


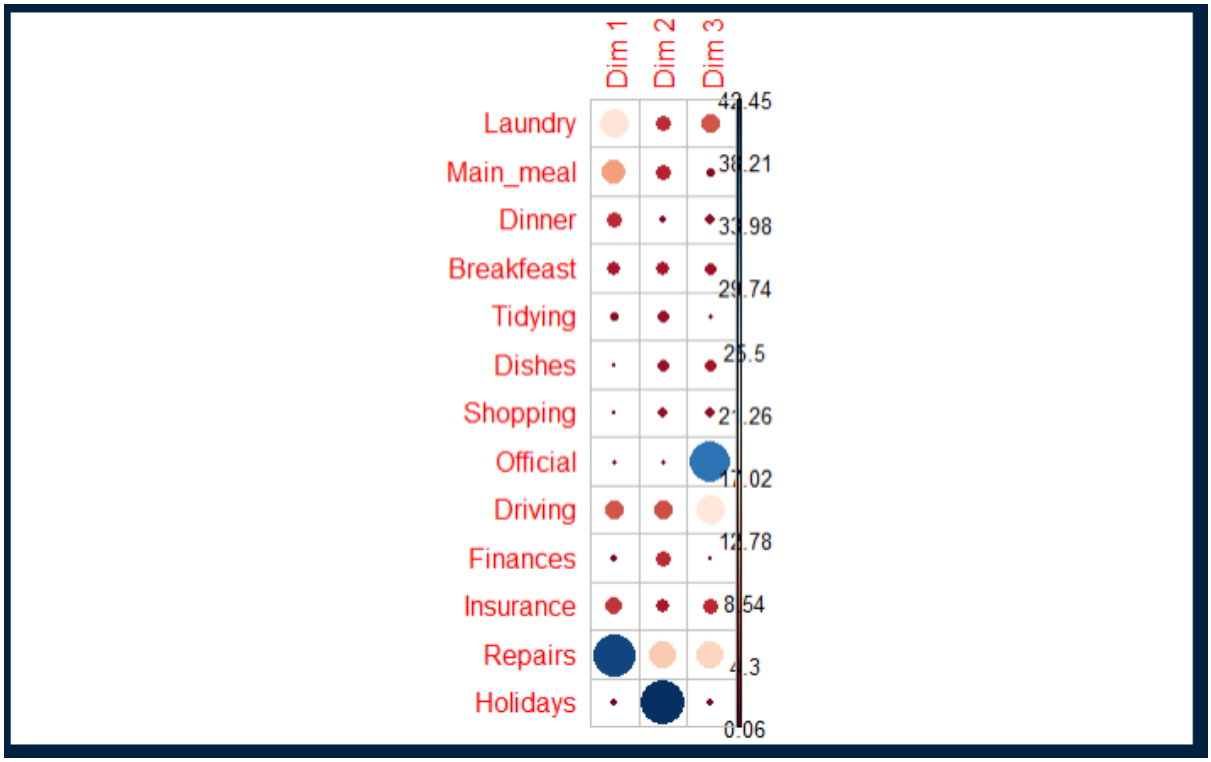

```
# Cos2
fviz_ca_row(ht.ca, col.row = "cos2", gradient.col =
c("#00AFBB", "#E7B800", "#FC4E07"), repel = TRUE)
corrplot(ht.ca.row$cos2, is.corr = FALSE)
```






```
#Contrib
fviz_ca_row(ht.ca, col.row = "contrib", gradient.col =
c("#00AFBB", "#E7B800", "#FC4E07"), repel = TRUE)
corrplot(ht.ca.row$contrib, is.corr = FALSE)
```

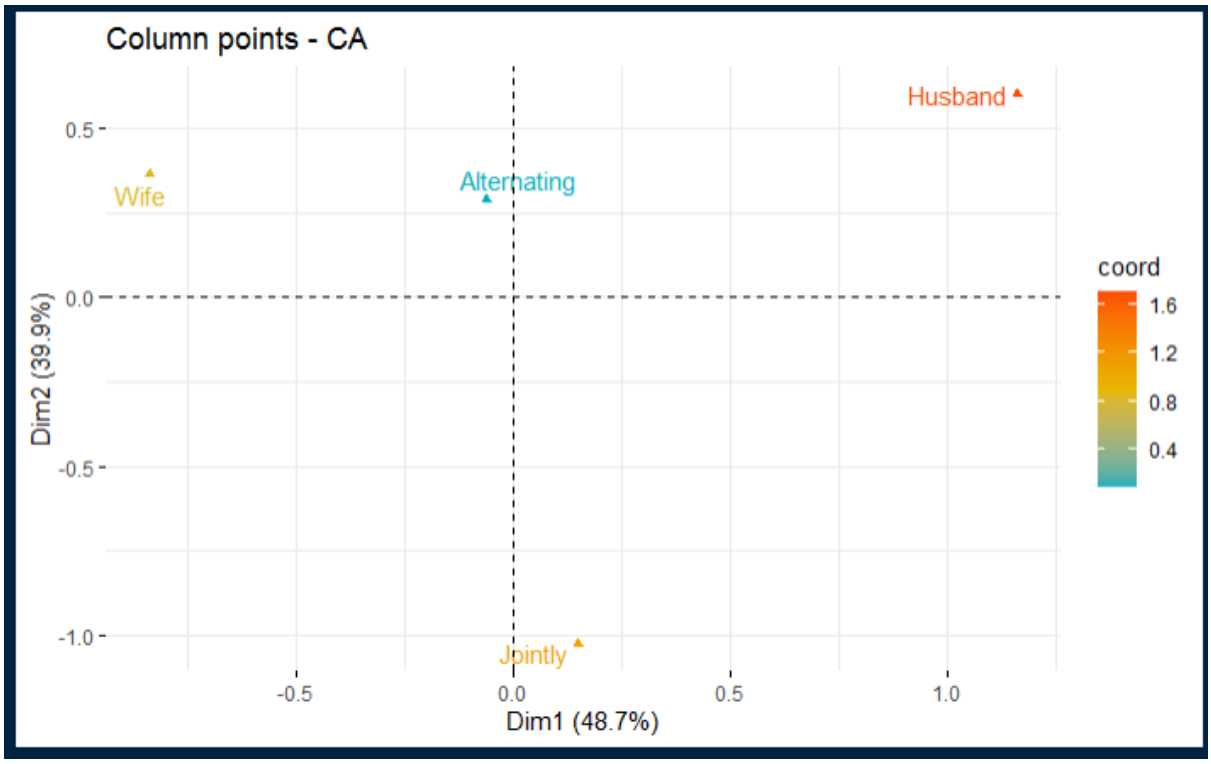


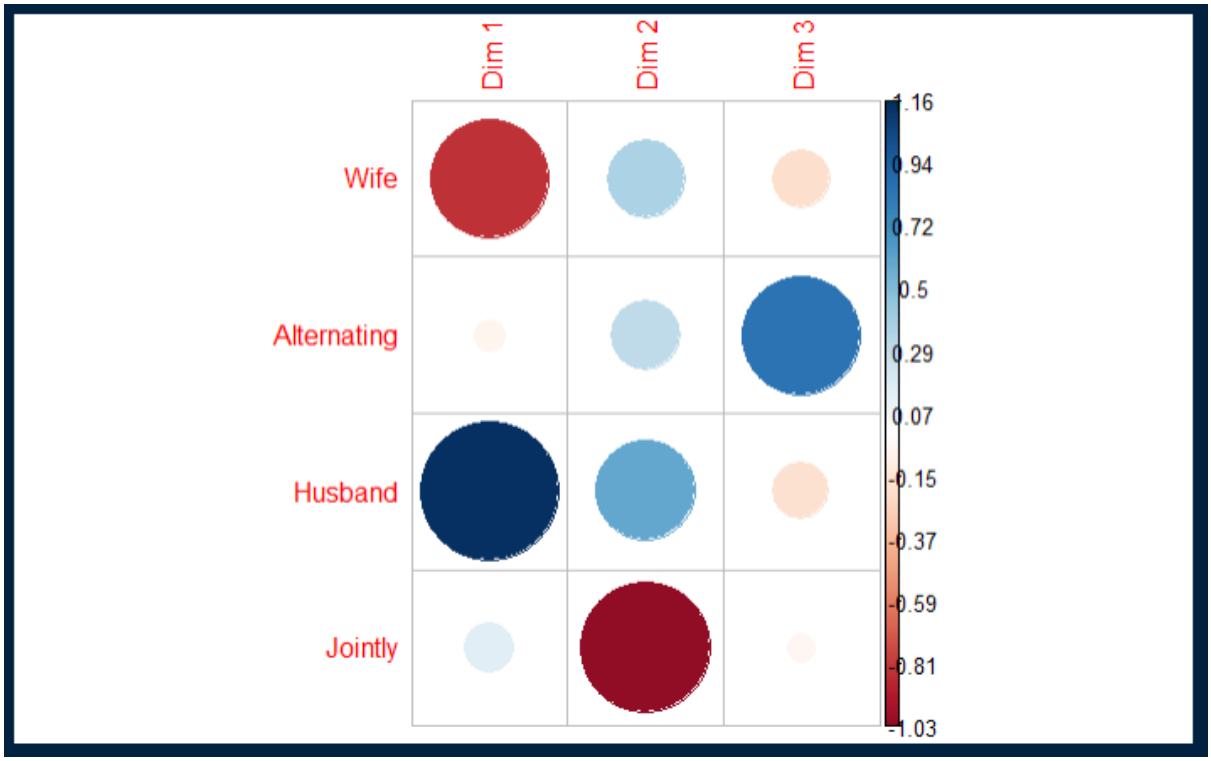



```{R}
# Graph of Column Variables
ht.ca.col <- ht.ca$col
ht.ca.col
```

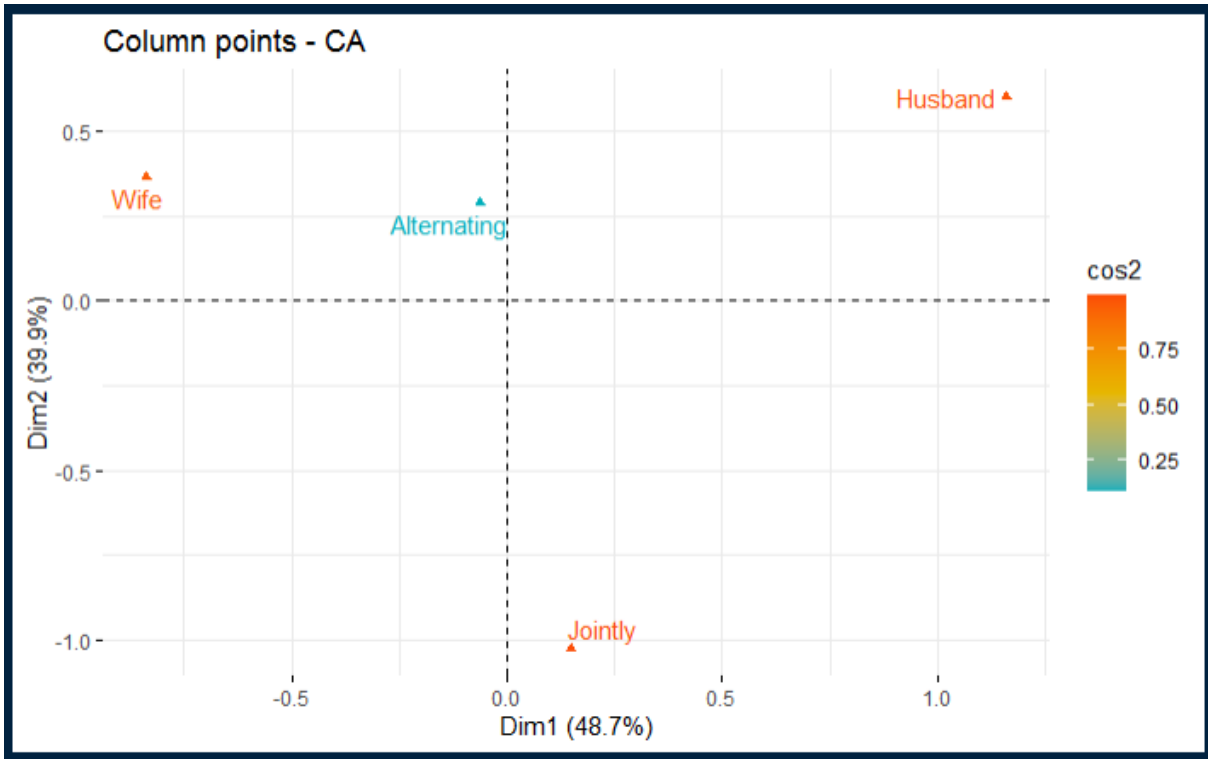
```
$coord
                Dim 1      Dim 2       Dim 3
Wife        -0.83762154  0.3652207 -0.19991139
Alternating -0.06218462  0.2915938  0.84858939
Husband      1.16091847  0.6019199 -0.18885924
Jointly      0.14942609 -1.0265791 -0.04644302

$contrib
                Dim 1     Dim 2      Dim 3
Wife        44.462018 10.312237 10.8220753
Alternating  0.103739  2.782794 82.5492464
Husband     54.233879 17.786612  6.1331792
Jointly      1.200364 69.118357  0.4954991

$cos2
                Dim 1      Dim 2       Dim 3
Wife        0.801875947 0.1524482 0.045675847
Alternating 0.004779897 0.1051016 0.890118521
Husband     0.772026244 0.2075420 0.020431728
Jointly     0.020705858 0.9772939 0.002000236

$inertia
[1] 0.3010185 0.1178242 0.3813729 0.3147248
```

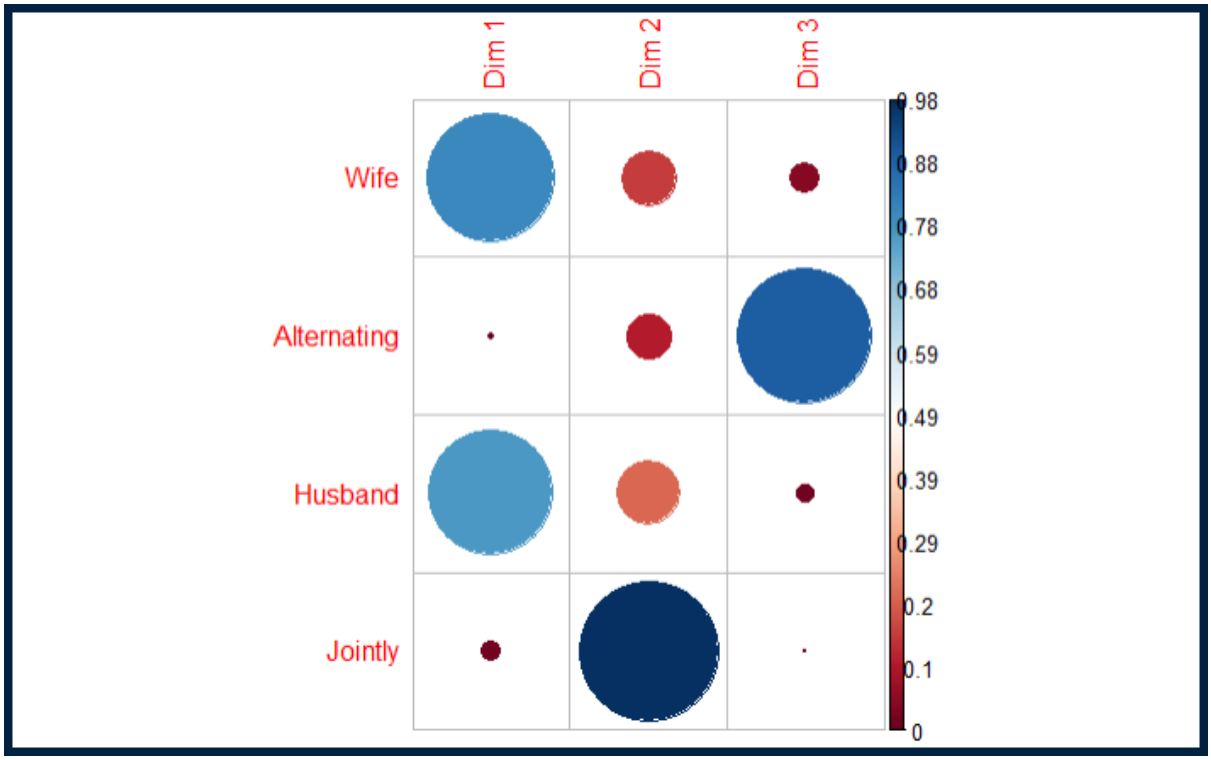
```
# Visual Row Variables
# Coord
fviz_ca_col(ht.ca, col.col = "coord", gradient.cols =
c("#00AFBB", "#E7B800", "#FC4E07"), repel = TRUE)
corrplot(ht.ca.col$coord, is.corr = FALSE)
```



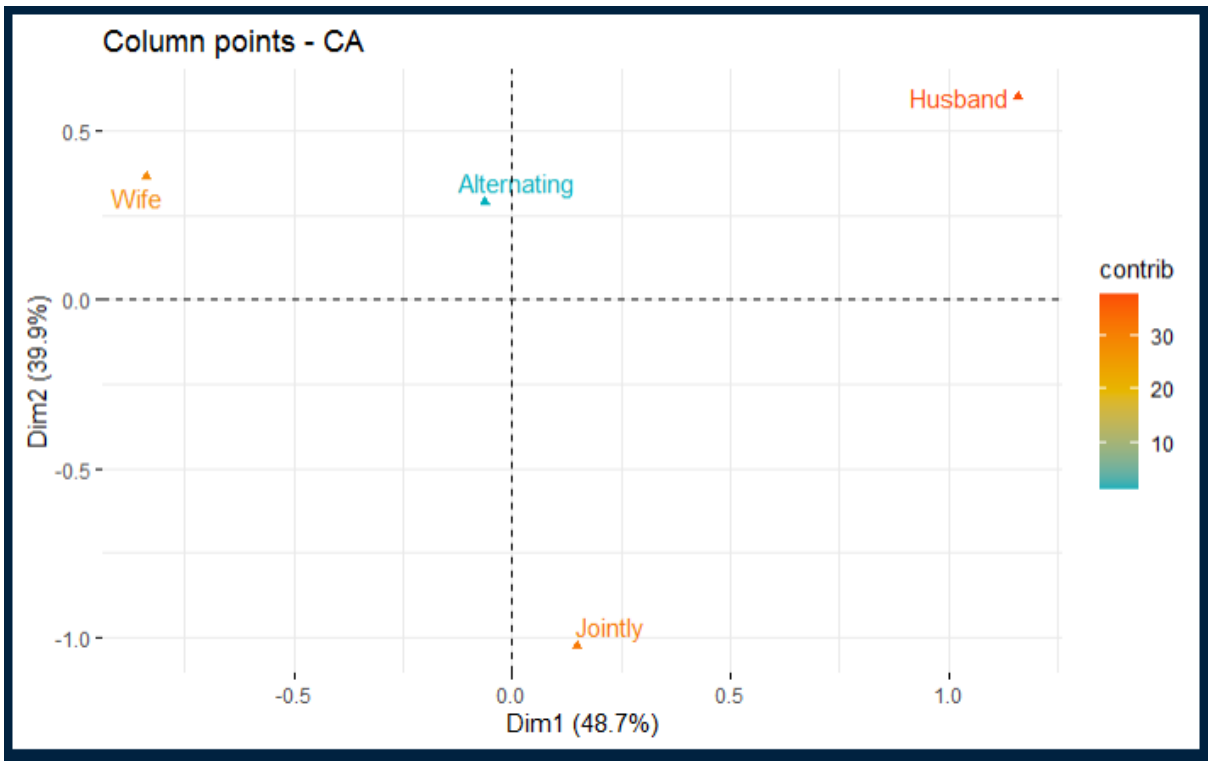


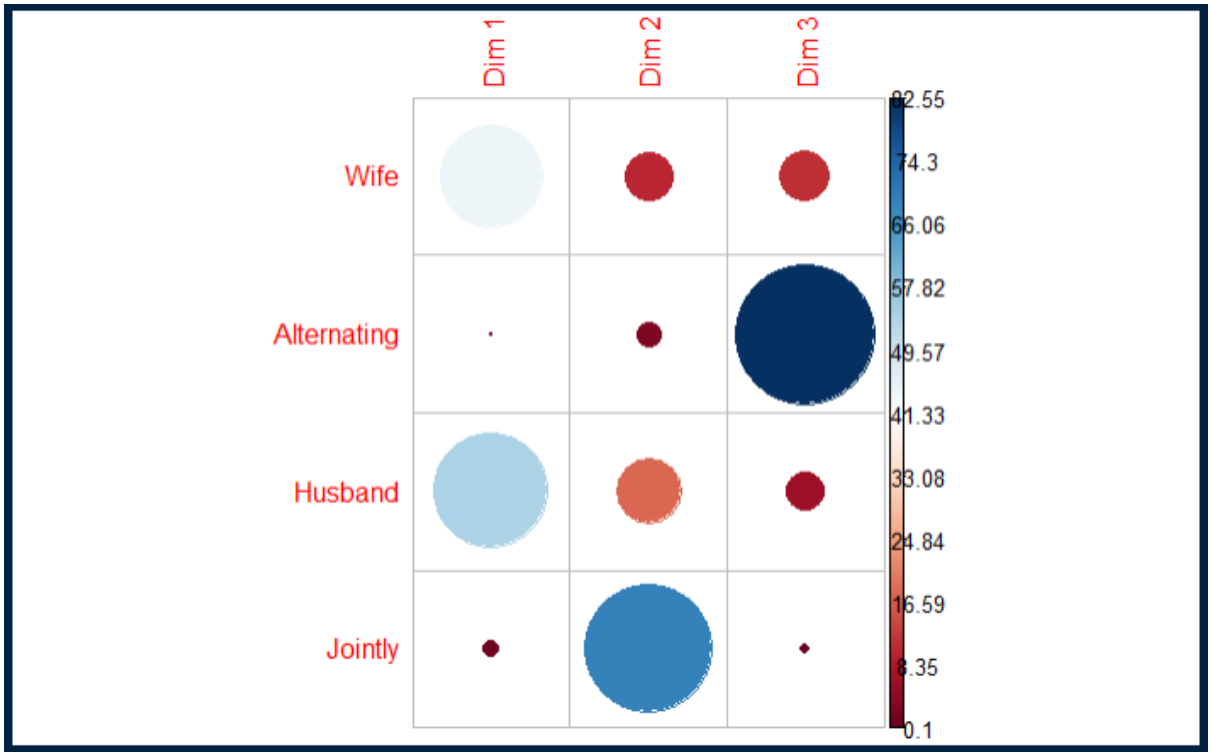

```
# Cos2
fviz_ca_col(ht.ca, col.col = "cos2", gradient.col =
c("#00AFBB", "#E7B800", "#FC4E07"), repel = TRUE)
corrplot(ht.ca.col$cos2, is.corr = FALSE)
```



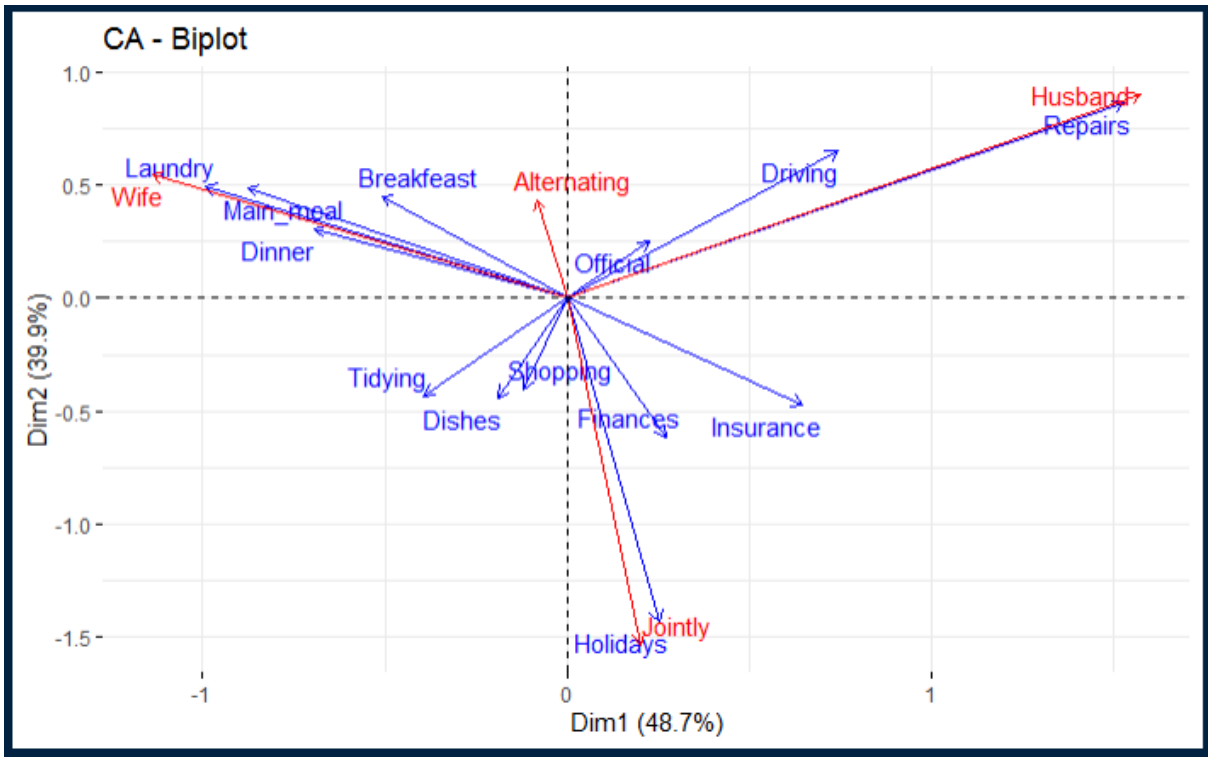



```
#Contrib
fviz_ca_col(ht.ca, col.col = "contrib", gradient.col =
c("#00AFBB", "#E7B800", "#FC4E07"), repel = TRUE)
corrplot(ht.ca.col$contrib, is.corr = FALSE)
```

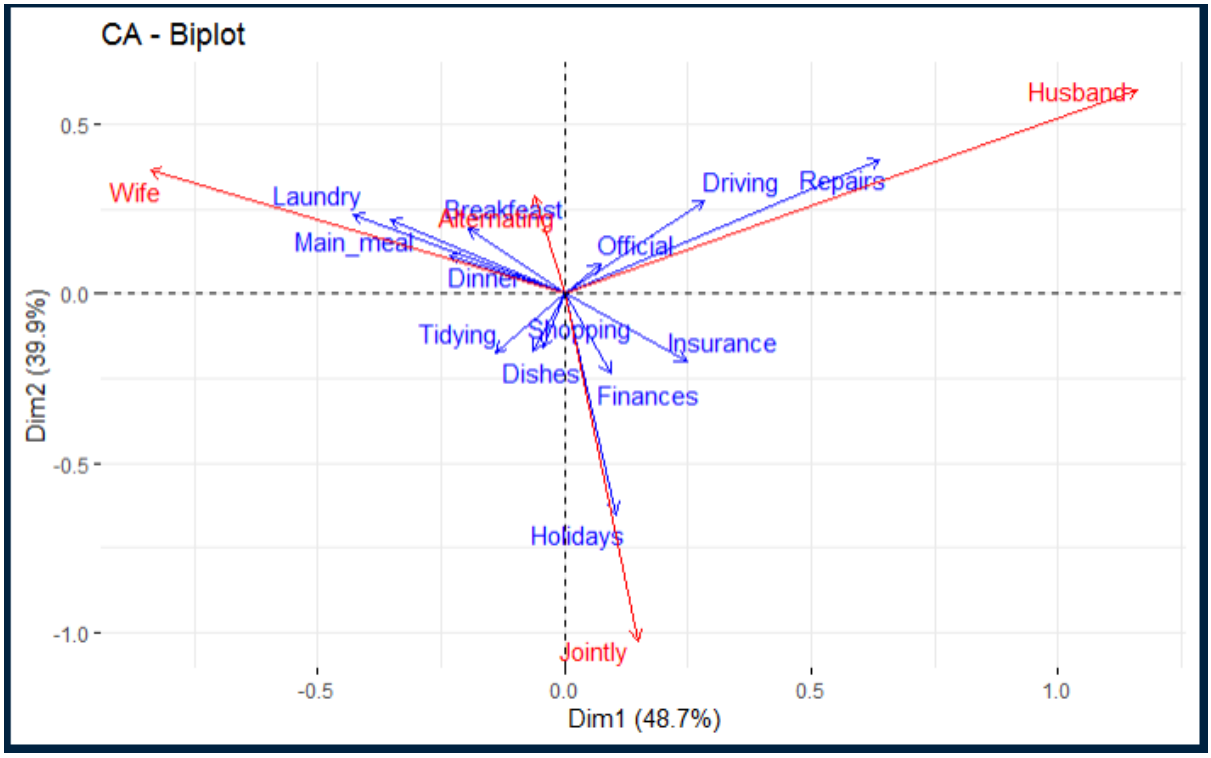





```{R}
# Biplot Options
# Asymmetric Biplot
fviz_ca_biplot(ht.ca, map ="rowprincipal", arrow = c(TRUE, TRUE), repel = TRUE)
```



```
#Contribution Biplot
fviz_ca_biplot(ht.ca, map = "colgreen", arrow = c(TRUE, TRUE),
repel = TRUE)
```




```{R}
#Dimension Description
ht.desc <- dimdesc(ht.ca, axes = c(1, 2))
ht.desc
```

```
$`Dim 1`
$`Dim 1`$row
                coord
Laundry    -0.9918368
Main_meal  -0.8755855
Dinner     -0.6925740
Breakfeast -0.5086002
Tidying    -0.3938084
Dishes     -0.1889641
Shopping   -0.1176813
Official    0.2266324
Holidays    0.2524863
Finances    0.2707669
Insurance   0.6470759
Driving     0.7417696
Repairs     1.5287787

$`Dim 1`$col
                 coord
Wife        -0.83762154
Alternating -0.06218462
Jointly      0.14942609
Husband      1.16091847


$`Dim 2`
$`Dim 2`$row
                coord
Holidays   -1.4350066
Finances   -0.6178684
Insurance  -0.4737832
Dishes     -0.4419662
Tidying    -0.4343444
Shopping   -0.4033171
Official    0.2536132
Dinner      0.3081043
Breakfeast  0.4528038
Main_meal   0.4901092
Laundry     0.4953220
Driving     0.6534143
Repairs     0.8642647

$`Dim 2`$col
                coord
Jointly     -1.0265791
Alternating  0.2915938
Wife         0.3652207
```

```{R}
# Dataset 1
mca1 <- data("USMortality")
mca1 <- USMortality[, c("Status", "Sex", "Cause")]
mca1
```

Description: df[,3] [40 x 3]

	Status <fctr>	Sex <fctr>	Cause <fctr>
1	Urban	Male	Heart disease
2	Rural	Male	Heart disease
3	Urban	Female	Heart disease
4	Rural	Female	Heart disease
53	Urban	Male	Cancer
54	Rural	Male	Cancer
55	Urban	Female	Cancer
56	Rural	Female	Cancer
105	Urban	Male	Lower respiratory
106	Rural	Male	Lower respiratory
107	Urban	Female	Lower respiratory
108	Rural	Female	Lower respiratory
157	Urban	Male	Unintentional injuries
158	Rural	Male	Unintentional injuries
159	Urban	Female	Unintentional injuries
160	Rural	Female	Unintentional injuries
209	Urban	Male	Cerebrovascular diseases
210	Rural	Male	Cerebrovascular diseases
211	Urban	Female	Cerebrovascular diseases
212	Rural	Female	Cerebrovascular diseases
261	Urban	Male	Alzheimers
262	Rural	Male	Alzheimers
263	Urban	Female	Alzheimers
264	Rural	Female	Alzheimers

Description: df[,3] [40 x 3]

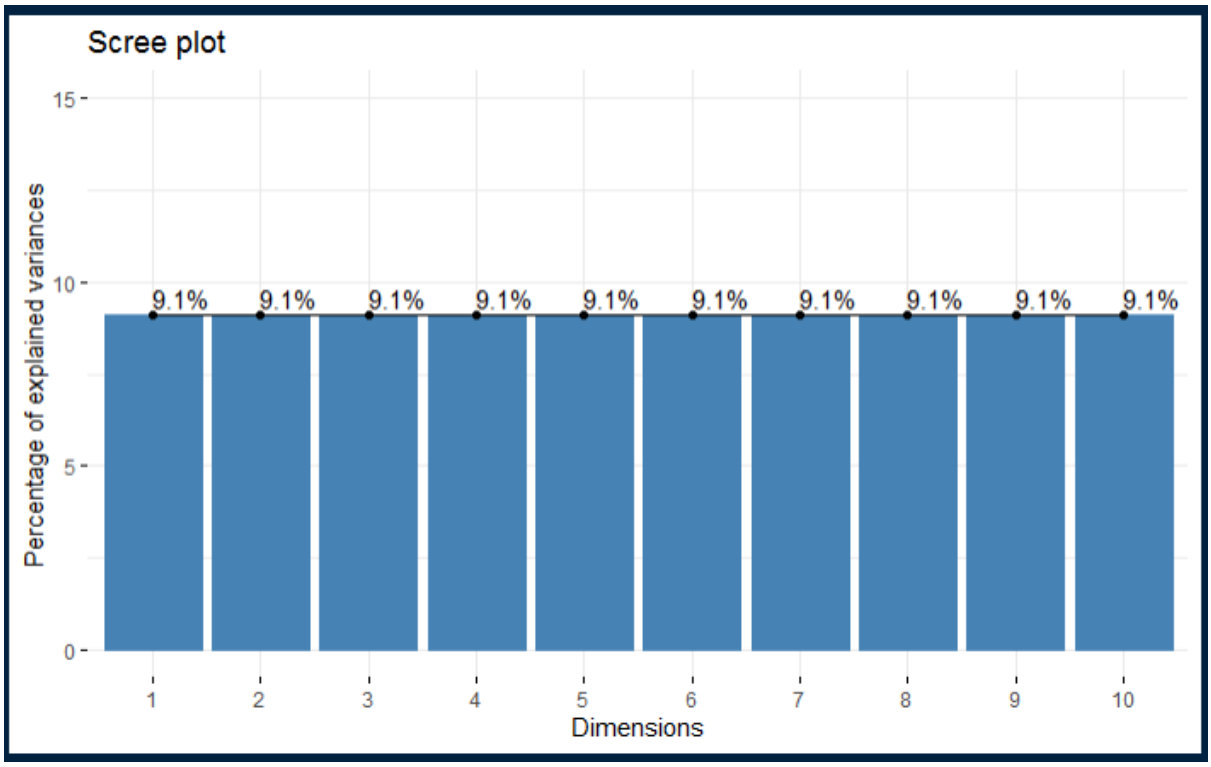
	Status <fctr>	Sex <fctr>	Cause <fctr>
313	Urban	Male	Diabetes
314	Rural	Male	Diabetes
315	Urban	Female	Diabetes
316	Rural	Female	Diabetes
365	Urban	Male	Flu and pneumonia
366	Rural	Male	Flu and pneumonia
367	Urban	Female	Flu and pneumonia
368	Rural	Female	Flu and pneumonia
417	Urban	Male	Suicide
418	Rural	Male	Suicide
419	Urban	Female	Suicide
420	Rural	Female	Suicide
469	Urban	Male	Nephritis
470	Rural	Male	Nephritis
471	Urban	Female	Nephritis
472	Rural	Female	Nephritis

```
# MCA
USM <- MCA(mca1, graph = FALSE)
USM
```

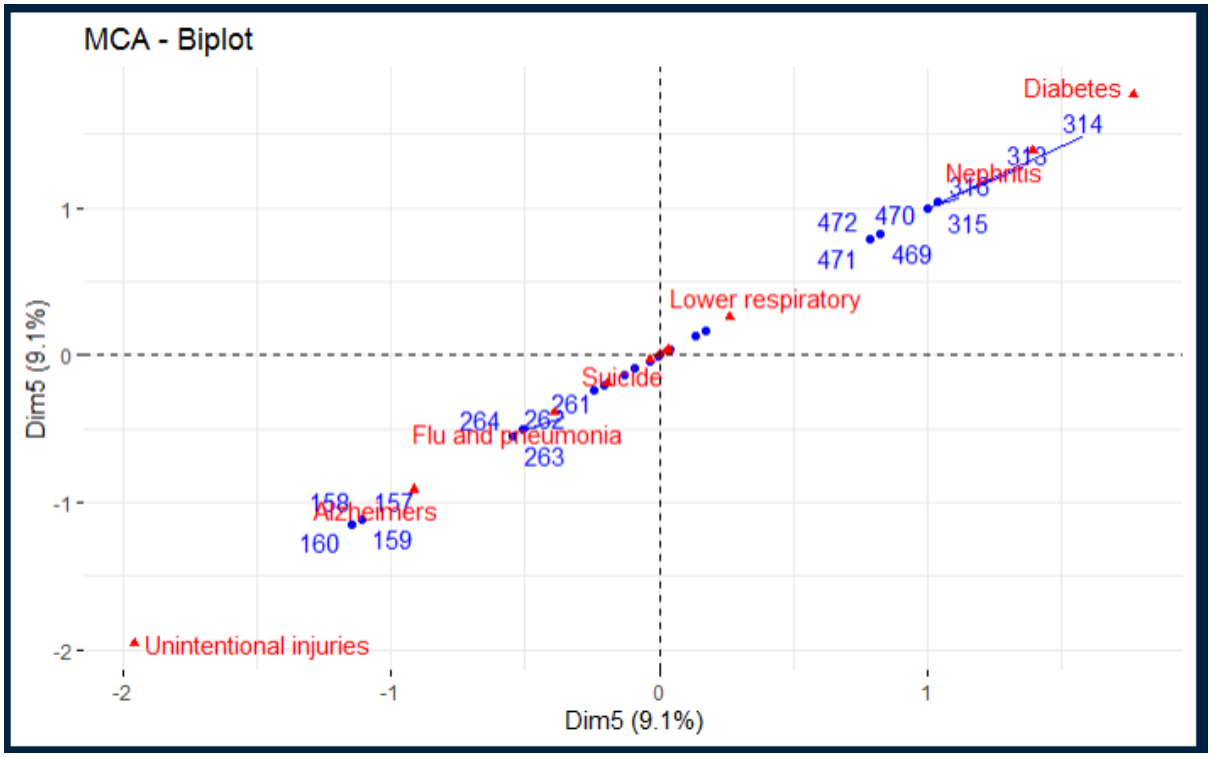
```
**Results of the Multiple Correspondence Analysis (MCA)**
The analysis was performed on 40 individuals, described by 3 variables
*The results are available in the following objects:

   name              description
1  "$eig"            "eigenvalues"
2  "$var"            "results for the variables"
3  "$var$coord"      "coord. of the categories"
4  "$var$cos2"       "cos2 for the categories"
5  "$var$contrib"    "contributions of the categories"
6  "$var$v.test"     "v-test for the categories"
7  "$ind"            "results for the individuals"
8  "$ind$coord"      "coord. for the individuals"
9  "$ind$cos2"       "cos2 for the individuals"
10 "$ind$contrib"    "contributions of the individuals"
11 "$call"           "intermediate results"
12 "$call$marge.col" "weights of columns"
13 "$call$marge.li"  "weights of rows"
```

```{R}
# Eigen Values / Variances
USM$eig
fviz_screeplot(USM, addlabels = TRUE, ylim = c(0, 15))
```

	eigenvalue	percentage of variance	cumulative percentage of variance
dim 1	0.3333333	9.090909	9.090909
dim 2	0.3333333	9.090909	18.181818
dim 3	0.3333333	9.090909	27.272727
dim 4	0.3333333	9.090909	36.363636
dim 5	0.3333333	9.090909	45.454545
dim 6	0.3333333	9.090909	54.545455
dim 7	0.3333333	9.090909	63.636364
dim 8	0.3333333	9.090909	72.727273
dim 9	0.3333333	9.090909	81.818182
dim 10	0.3333333	9.090909	90.909091
dim 11	0.3333333	9.090909	100.000000




```{R}
# Biplot
fviz_mca_biplot(USM, axes = c(5, 5), repel = TRUE)
```

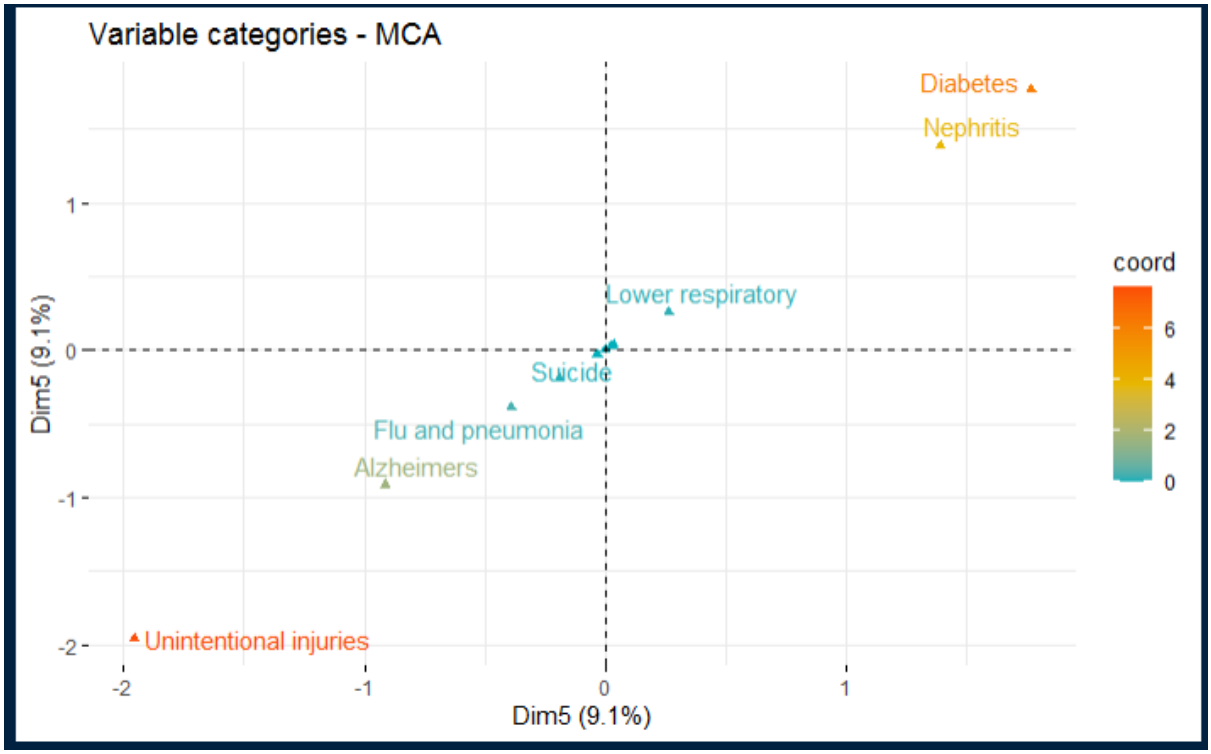



```{R}
# Graph of Variables
USM$var
```

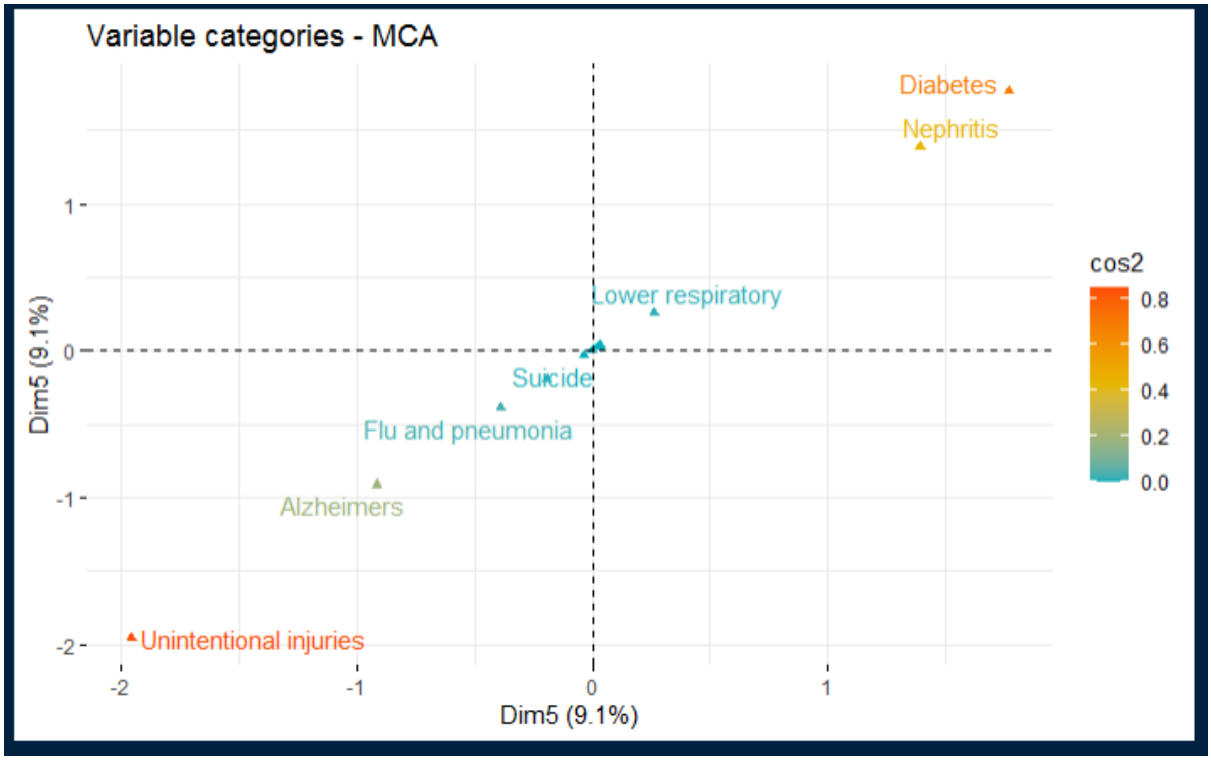
```
$coord
                              Dim 1         Dim 2         Dim 3         Dim 4         Dim 5
Rural                 -1.000000e+00  0.000000e+00  0.000000e+00  0.000000e+00  0.000000e+00
Urban                  1.000000e+00 -5.374728e-16  5.409553e-19  6.266908e-20  1.243683e-19
Female                 1.054694e-16  3.099826e-01 -1.455173e-01 -1.685802e-02 -3.345516e-02
Male                  -5.520517e-17 -3.099826e-01  1.455173e-01  1.685802e-02  3.345516e-02
Alzheimers             3.000931e-17  3.169141e-01 -1.999499e+00  1.803556e-01 -9.141721e-01
Cancer                 4.525563e-17  3.169141e-01  1.405934e+00 -1.998884e-01  3.552012e-02
Cerebrovascular diseases 3.519594e-17  3.169141e-01 -1.030472e+00 -8.303633e-01  2.496929e-02
Diabetes               3.340944e-17  3.169141e-01 -1.726013e-01  2.086560e+00  1.768206e+00
Flu and pneumonia      3.668868e-17  3.169141e-01  9.407630e-02 -9.460840e-01 -3.891733e-01
Heart disease         -8.218778e-16 -2.852227e+00 -1.423346e-01 -1.648931e-02 -3.272344e-02
Lower respiratory      2.186105e-17  3.169141e-01  1.411518e+00 -5.559790e-01  2.630649e-01
Nephritis              3.056312e-17  3.169141e-01 -4.804296e-01 -4.906103e-01  1.391759e+00
Suicide                3.208062e-17  3.169141e-01  2.954906e-01 -8.663287e-01 -1.905040e-01
Unintentional injuries 3.202160e-17  3.169141e-01  6.183179e-01  1.638827e+00 -1.956947e+00

$contrib
                              Dim 1         Dim 2         Dim 3         Dim 4         Dim 5
Rural                 5.000000e+01 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00
Urban                 5.000000e+01 1.444385e-29 1.463163e-35 1.963707e-37 7.733740e-37
Female                5.561898e-31 4.804462e+00 1.058764e+00 1.420964e-02 5.596237e-02
Male                  1.523805e-31 4.804462e+00 1.058764e+00 1.420964e-02 5.596237e-02
Alzheimers            9.005588e-33 1.004345e+00 3.997998e+01 3.252815e-01 8.357106e+00
Cancer                2.048072e-32 1.004345e+00 1.976651e+01 3.995539e-01 1.261679e-02
Cerebrovascular diseases 1.238754e-32 1.004345e+00 1.061872e+01 6.895032e+00 6.234654e-03
Diabetes              1.116190e-32 1.004345e+00 2.979121e-01 4.353733e+01 3.126554e+01
Flu and pneumonia     1.346059e-32 1.004345e+00 8.850350e-02 8.950749e+00 1.514559e+00
Heart disease         6.754831e-30 8.135197e+01 2.025914e-01 2.718973e-03 1.070823e-02
Lower respiratory     4.779057e-33 1.004345e+00 1.992382e+01 3.091126e+00 6.920316e-01
Nephritis             9.341041e-33 1.004345e+00 2.308126e+00 2.406985e+00 1.936994e+01
Suicide               1.029166e-32 1.004345e+00 8.731469e-01 7.505254e+00 3.629178e-01
Unintentional injuries 1.025383e-32 1.004345e+00 3.823170e+00 2.685755e+01 3.829642e+01
```

```
$cos2
                          Dim 1        Dim 2        Dim 3        Dim 4        Dim 5
Rural                 1.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00
Urban                 1.000000e+00 2.888770e-31 2.926326e-37 3.927413e-39 1.546748e-38
Female                1.112380e-32 9.608924e-02 2.117528e-02 2.841928e-04 1.119247e-03
Male                  3.047611e-33 9.608924e-02 2.117528e-02 2.841928e-04 1.119247e-03
Alzheimers            1.000621e-34 1.115939e-02 4.442219e-01 3.614239e-03 9.285673e-02
Cancer                2.275635e-34 1.115939e-02 2.196279e-01 4.439487e-03 1.401865e-04
Cerebrovascular diseases 1.376394e-34 1.115939e-02 1.179858e-01 7.661147e-02 6.927394e-05
Diabetes              1.240212e-34 1.115939e-02 3.310134e-03 4.837481e-01 3.473949e-01
Flu and pneumonia     1.495621e-34 1.115939e-02 9.833723e-04 9.945277e-02 1.682843e-02
Heart disease         7.505368e-32 9.039108e-01 2.251015e-03 3.021081e-05 1.189804e-04
Lower respiratory     5.310063e-35 1.115939e-02 2.213758e-01 3.434585e-02 7.689240e-03
Nephritis             1.037893e-34 1.115939e-02 2.564585e-02 2.674427e-02 2.152216e-01
Suicide               1.143518e-34 1.115939e-02 9.701633e-03 8.339172e-02 4.032420e-03
Unintentional injuries 1.139315e-34 1.115939e-02 4.247967e-02 2.984172e-01 4.255158e-01

$v.test
                          Dim 1        Dim 2        Dim 3        Dim 4        Dim 5
Rural                -6.244998e+00  0.000000e+00  0.000000e+00  0.000000e+00  0.000000e+00
Urban                 6.244998e+00 -3.356516e-15  3.378265e-18  3.913683e-19  7.766799e-19
Female                6.586562e-16  1.935841e+00 -9.087552e-01 -1.052783e-01 -2.089274e-01
Male                 -3.447562e-16 -1.935841e+00  9.087552e-01  1.052783e-01  2.089274e-01
Alzheimers            6.246937e-17  6.597092e-01 -4.162290e+00  3.754402e-01 -1.903001e+00
Cancer                9.420710e-17  6.597092e-01  2.926685e+00 -4.161010e-01  7.394102e-02
Cerebrovascular diseases  7.326619e-17  6.597092e-01 -2.145098e+00 -1.728539e+00  5.197772e-02
Diabetes              6.954729e-17  6.597092e-01 -3.592982e-01  4.343521e+00  3.680815e+00
Flu and pneumonia     7.637357e-17  6.597092e-01  1.958354e-01 -1.969431e+00 -8.101289e-01
Heart disease        -1.710875e-15 -5.937383e+00 -2.962931e-01 -3.432523e-02 -6.811927e-02
Lower respiratory     4.550741e-17  6.597092e-01  2.938308e+00 -1.157363e+00  5.476133e-01
Nephritis             6.362220e-17  6.597092e-01 -1.000094e+00 -1.021287e+00  2.897178e+00
Suicide               6.678114e-17  6.597092e-01  6.151127e-01 -1.803407e+00 -3.965657e-01
Unintentional injuries  6.665828e-17  6.597092e-01  1.287131e+00  3.411491e+00 -4.073710e+00

$eta2
             Dim 1        Dim 2        Dim 3        Dim 4        Dim 5
Status 1.000000e+00 1.444385e-31 1.463163e-37 1.963707e-39 7.733740e-39
Sex    7.085703e-33 9.608924e-02 2.117528e-02 2.841928e-04 1.119247e-03
Cause  6.855993e-32 9.039108e-01 9.788247e-01 9.997158e-01 9.988808e-01
```

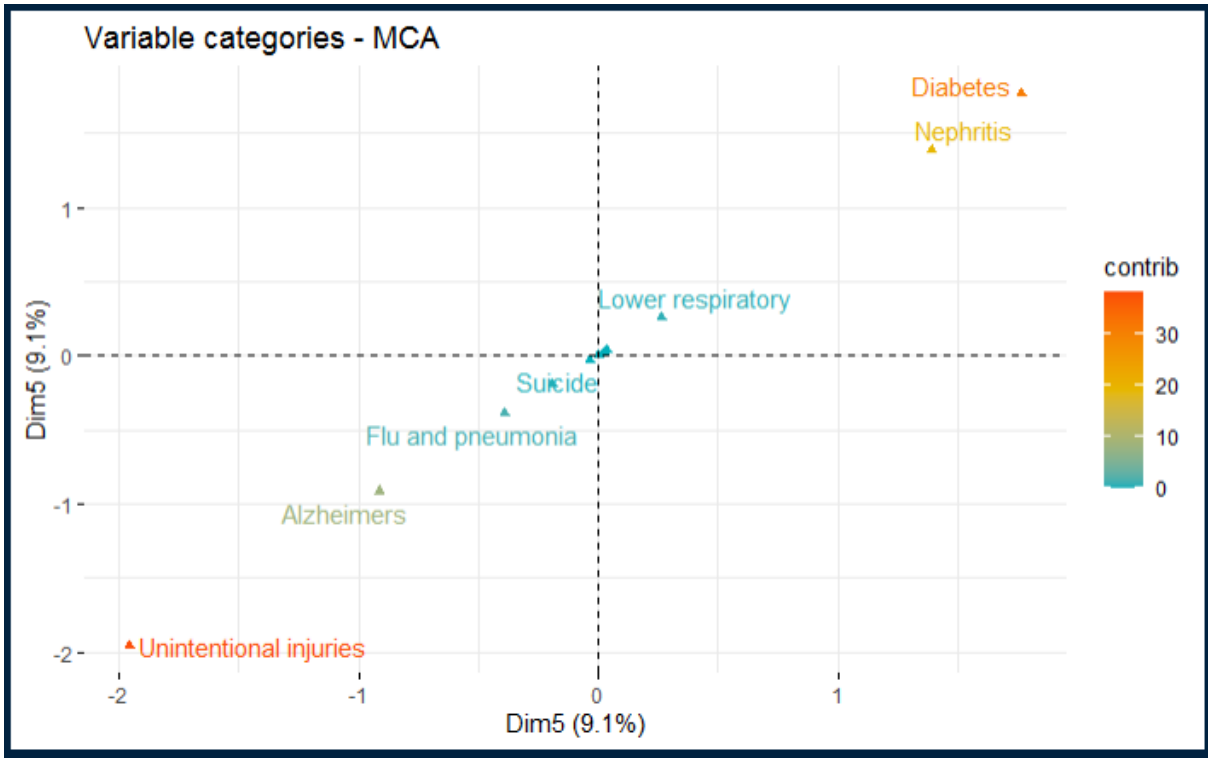
```
# Coord
fviz_mca_var(USM, col.var = "coord", gradient.cols = c("#00AFBB", "#E7B800", "#FC4E07"), axes = c(5, 5), repel = TRUE)
```



```
# Cos2
fviz_mca_var(USM, col.var = "cos2", gradient.cols =
c("#00AFBB", "#E7B800", "#FC4E07"), axes = c(5, 5), repel =
TRUE)
```




```
# Contrib
fviz_mca_var(USM, col.var = "contrib", gradient.cols =
c("#00AFBB", "#E7B800", "#FC4E07"), axes = c(5, 5), repel =
TRUE)
```
```
```




```{R}
# Graph of Individuals
USM$ind
```

$coord

	Dim 1	Dim 2	Dim 3	Dim 4	Dim 5
1	0.5773503	-1.825702385	0.001837532	0.000212876	0.0004224578
2	-0.5773503	-1.825702385	0.001837532	0.000212876	0.0004224578
3	0.5773503	-1.467765254	-0.166191368	-0.019253089	-0.0382082283
4	-0.5773503	-1.467765254	-0.166191368	-0.019253089	-0.0382082283
53	0.5773503	0.004001859	0.895730884	-0.105672658	0.0398228917
54	-0.5773503	0.004001859	0.895730884	-0.105672658	0.0398228917
55	0.5773503	0.361938990	0.727701984	-0.125138623	0.0011922056
56	-0.5773503	0.361938990	0.727701984	-0.125138623	0.0011922056
105	0.5773503	0.004001859	0.898954534	-0.311261634	0.1711959559
106	-0.5773503	0.004001859	0.898954534	-0.311261634	0.1711959559
107	0.5773503	0.361938990	0.730925634	-0.330727599	0.1325652699
108	-0.5773503	0.361938990	0.730925634	-0.330727599	0.1325652699
157	0.5773503	0.004001859	0.441000448	0.955910327	-1.1105286541
158	-0.5773503	0.004001859	0.441000448	0.955910327	-1.1105286541
159	0.5773503	0.361938990	0.272971549	0.936444362	-1.1491593401
160	-0.5773503	0.361938990	0.272971549	0.936444362	-1.1491593401
209	0.5773503	0.004001859	-0.510928641	-0.469677494	0.0337313691
210	-0.5773503	0.004001859	-0.510928641	-0.469677494	0.0337313691
211	0.5773503	0.361938990	-0.678957541	-0.489143459	-0.0048993170
212	-0.5773503	0.361938990	-0.678957541	-0.489143459	-0.0048993170
261	0.5773503	0.004001859	-1.070397023	0.113861352	-0.5084821483
262	-0.5773503	0.004001859	-1.070397023	0.113861352	-0.5084821483
263	0.5773503	0.361938990	-1.238425923	0.094395387	-0.5471128344
264	-0.5773503	0.361938990	-1.238425923	0.094395387	-0.5471128344
313	0.5773503	0.004001859	-0.015636952	1.214409051	1.0401897585
314	-0.5773503	0.004001859	-0.015636952	1.214409051	1.0401897585
315	0.5773503	0.361938990	-0.183665852	1.194943086	1.0015590724
316	-0.5773503	0.361938990	-0.183665852	1.194943086	1.0015590724
365	0.5773503	0.004001859	0.138329428	-0.536488858	-0.2053739741
366	-0.5773503	0.004001859	0.138329428	-0.536488858	-0.2053739741
367	0.5773503	0.361938990	-0.029699472	-0.555954823	-0.2440046602
368	-0.5773503	0.361938990	-0.029699472	-0.555954823	-0.2440046602
417	0.5773503	0.004001859	0.254616026	-0.490442135	-0.0906722033
418	-0.5773503	0.004001859	0.254616026	-0.490442135	-0.0906722033
419	0.5773503	0.361938990	0.086587127	-0.509908100	-0.1293028894
420	-0.5773503	0.361938990	0.086587127	-0.509908100	-0.1293028894
469	0.5773503	0.004001859	-0.193361737	-0.273521001	0.8228479772
470	-0.5773503	0.004001859	-0.193361737	-0.273521001	0.8228479772
471	0.5773503	0.361938990	-0.361390637	-0.292986966	0.7842172912
472	-0.5773503	0.361938990	-0.361390637	-0.292986966	0.7842172912

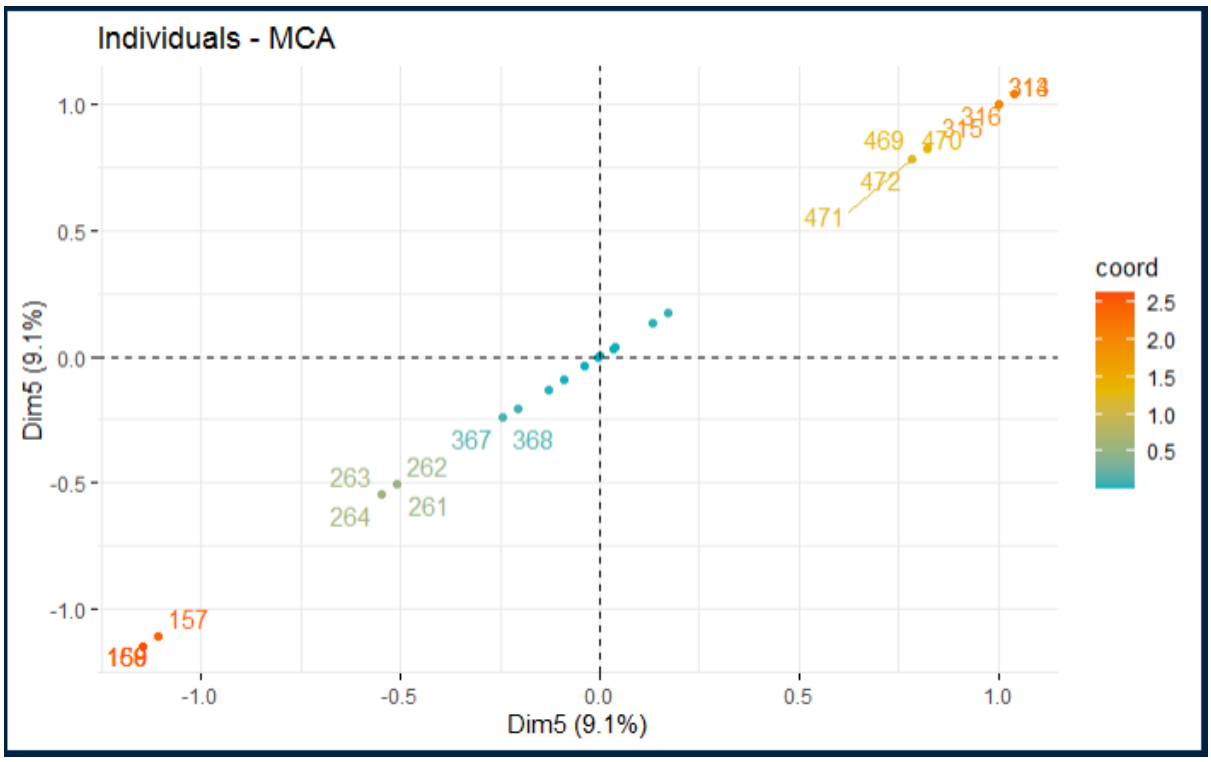
$contrib

	Dim 1	Dim 2	Dim 3	Dim 4	Dim 5
1	2.5	2.499892e+01	2.532392e-05	3.398716e-07	1.338529e-06
2	2.5	2.499892e+01	2.532392e-05	3.398716e-07	1.338529e-06
3	2.5	1.615751e+01	2.071468e-01	2.780111e-03	1.094902e-02
4	2.5	1.615751e+01	2.071468e-01	2.780111e-03	1.094902e-02
53	2.5	1.201116e-04	6.017504e+00	8.375033e-02	1.189397e-02
54	2.5	1.201116e-04	6.017504e+00	8.375033e-02	1.189397e-02
55	2.5	9.824987e-01	3.971626e+00	1.174476e-01	1.066016e-05
56	2.5	9.824987e-01	3.971626e+00	1.174476e-01	1.066016e-05
105	2.5	1.201116e-04	6.060894e+00	7.266285e-01	2.198104e-01
106	2.5	1.201116e-04	6.060894e+00	7.266285e-01	2.198104e-01
107	2.5	9.824987e-01	4.006892e+00	8.203556e-01	1.318016e-01
108	2.5	9.824987e-01	4.006892e+00	8.203556e-01	1.318016e-01
157	2.5	1.201116e-04	1.458610e+00	6.853234e+00	9.249554e+00
158	2.5	1.201116e-04	1.458610e+00	6.853234e+00	9.249554e+00
159	2.5	9.824987e-01	5.588510e-01	6.576960e+00	9.904254e+00
160	2.5	9.824987e-01	5.588510e-01	6.576960e+00	9.904254e+00
209	2.5	1.201116e-04	1.957861e+00	1.654477e+00	8.533539e-03
210	2.5	1.201116e-04	1.957861e+00	1.654477e+00	8.533539e-03
211	2.5	9.824987e-01	3.457375e+00	1.794460e+00	1.800248e-04
212	2.5	9.824987e-01	3.457375e+00	1.794460e+00	1.800248e-04
261	2.5	1.201116e-04	8.593123e+00	9.723306e-02	1.939156e+00
262	2.5	1.201116e-04	8.593123e+00	9.723306e-02	1.939156e+00
263	2.5	9.824987e-01	1.150274e+01	6.682867e-02	2.244993e+00
264	2.5	9.824987e-01	1.150274e+01	6.682867e-02	2.244993e+00
313	2.5	1.201116e-04	1.833857e-03	1.106092e+01	8.114961e+00
314	2.5	1.201116e-04	1.833857e-03	1.106092e+01	8.114961e+00
315	2.5	9.824987e-01	2.529986e-01	1.070917e+01	7.523404e+00
316	2.5	9.824987e-01	2.529986e-01	1.070917e+01	7.523404e+00
365	2.5	1.201116e-04	1.435127e-01	2.158652e+00	3.163385e-01
366	2.5	1.201116e-04	1.435127e-01	2.158652e+00	3.163385e-01
367	2.5	9.824987e-01	6.615440e-03	2.318143e+00	4.465371e-01
368	2.5	9.824987e-01	6.615440e-03	2.318143e+00	4.465371e-01
417	2.5	1.201116e-04	4.862199e-01	1.804001e+00	6.166086e-02
418	2.5	1.201116e-04	4.862199e-01	1.804001e+00	6.166086e-02
419	2.5	9.824987e-01	5.622998e-02	1.950047e+00	1.253943e-01
420	2.5	9.824987e-01	5.622998e-02	1.950047e+00	1.253943e-01
469	2.5	1.201116e-04	2.804157e-01	5.611030e-01	5.078091e+00
470	2.5	1.201116e-04	2.804157e-01	5.611030e-01	5.078091e+00
471	2.5	9.824987e-01	9.795239e-01	6.438102e-01	4.612476e+00
472	2.5	9.824987e-01	9.795239e-01	6.438102e-01	4.612476e+00

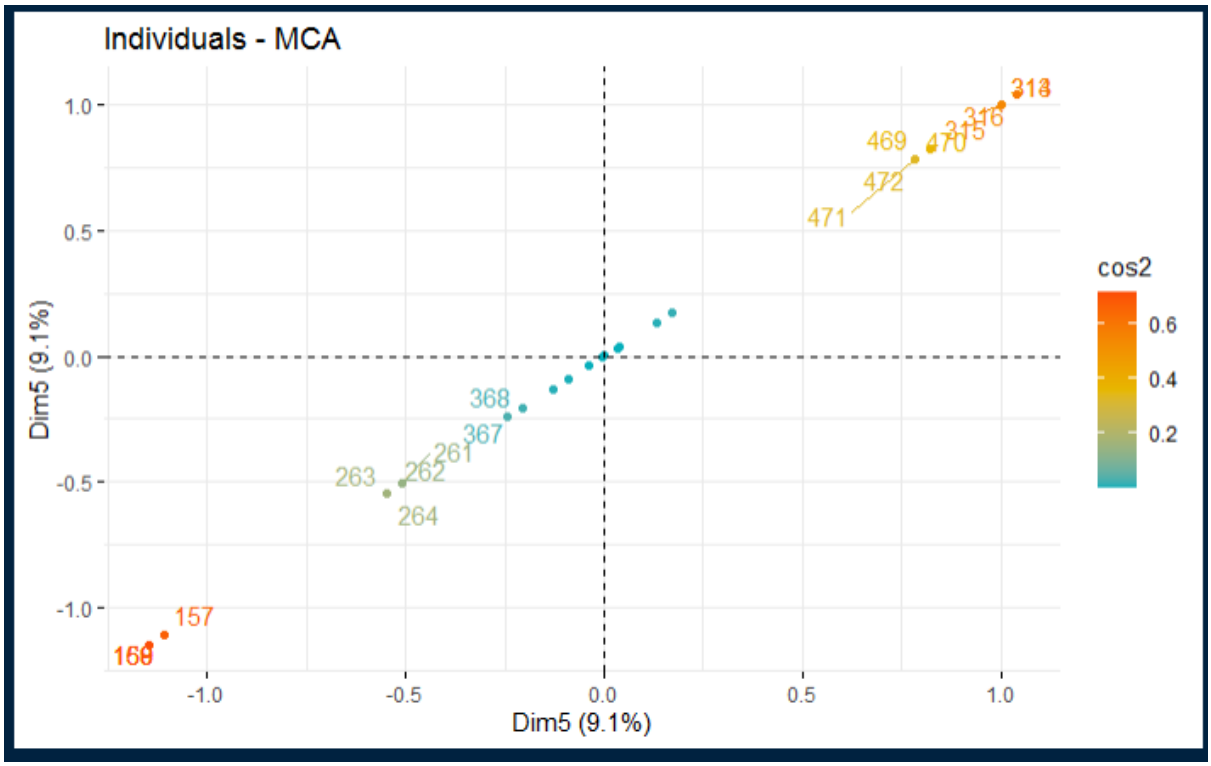
$cos2

	Dim 1	Dim 2	Dim 3	Dim 4	Dim 5
1	0.09090909	9.090516e-01	9.208699e-07	1.235897e-08	4.867379e-08
2	0.09090909	9.090516e-01	9.208699e-07	1.235897e-08	4.867379e-08
3	0.09090909	5.875459e-01	7.532610e-03	1.010949e-04	3.981460e-04
4	0.09090909	5.875459e-01	7.532610e-03	1.010949e-04	3.981460e-04
53	0.09090909	4.367693e-06	2.188183e-01	3.045467e-03	4.325080e-04
54	0.09090909	4.367693e-06	2.188183e-01	3.045467e-03	4.325080e-04
55	0.09090909	3.572723e-02	1.444228e-01	4.270820e-03	3.876421e-07
56	0.09090909	3.572723e-02	1.444228e-01	4.270820e-03	3.876421e-07
105	0.09090909	4.367693e-06	2.203962e-01	2.642286e-02	7.993106e-03
106	0.09090909	4.367693e-06	2.203962e-01	2.642286e-02	7.993106e-03
107	0.09090909	3.572723e-02	1.457052e-01	2.983111e-02	4.792787e-03
108	0.09090909	3.572723e-02	1.457052e-01	2.983111e-02	4.792787e-03
157	0.09090909	4.367693e-06	5.304038e-02	2.492085e-01	3.363474e-01
158	0.09090909	4.367693e-06	5.304038e-02	2.492085e-01	3.363474e-01
159	0.09090909	3.572723e-02	2.032185e-02	2.391622e-01	3.601547e-01
160	0.09090909	3.572723e-02	2.032185e-02	2.391622e-01	3.601547e-01
209	0.09090909	4.367693e-06	7.119493e-02	6.016280e-02	3.103105e-04
210	0.09090909	4.367693e-06	7.119493e-02	6.016280e-02	3.103105e-04
211	0.09090909	3.572723e-02	1.257227e-01	6.525309e-02	6.546356e-06
212	0.09090909	3.572723e-02	1.257227e-01	6.525309e-02	6.546356e-06
261	0.09090909	4.367693e-06	3.124772e-01	3.535747e-03	7.051475e-02
262	0.09090909	4.367693e-06	3.124772e-01	3.535747e-03	7.051475e-02
263	0.09090909	3.572723e-02	4.182815e-01	2.430133e-03	8.163612e-02
264	0.09090909	3.572723e-02	4.182815e-01	2.430133e-03	8.163612e-02
313	0.09090909	4.367693e-06	6.668571e-05	4.022153e-01	2.950895e-01
314	0.09090909	4.367693e-06	6.668571e-05	4.022153e-01	2.950895e-01
315	0.09090909	3.572723e-02	9.199949e-03	3.894243e-01	2.735783e-01
316	0.09090909	3.572723e-02	9.199949e-03	3.894243e-01	2.735783e-01
365	0.09090909	4.367693e-06	5.218645e-03	7.849644e-02	1.150322e-02
366	0.09090909	4.367693e-06	5.218645e-03	7.849644e-02	1.150322e-02
367	0.09090909	3.572723e-02	2.405614e-04	8.429612e-02	1.623771e-02
368	0.09090909	3.572723e-02	2.405614e-04	8.429612e-02	1.623771e-02
417	0.09090909	4.367693e-06	1.768072e-02	6.560004e-02	2.242213e-03
418	0.09090909	4.367693e-06	1.768072e-02	6.560004e-02	2.242213e-03
419	0.09090909	3.572723e-02	2.044727e-03	7.091080e-02	4.559792e-03
420	0.09090909	3.572723e-02	2.044727e-03	7.091080e-02	4.559792e-03
469	0.09090909	4.367693e-06	1.019693e-02	2.040375e-02	1.846579e-01
470	0.09090909	4.367693e-06	1.019693e-02	2.040375e-02	1.846579e-01
471	0.09090909	3.572723e-02	3.561905e-02	2.341128e-02	1.677264e-01
472	0.09090909	3.572723e-02	3.561905e-02	2.341128e-02	1.677264e-01

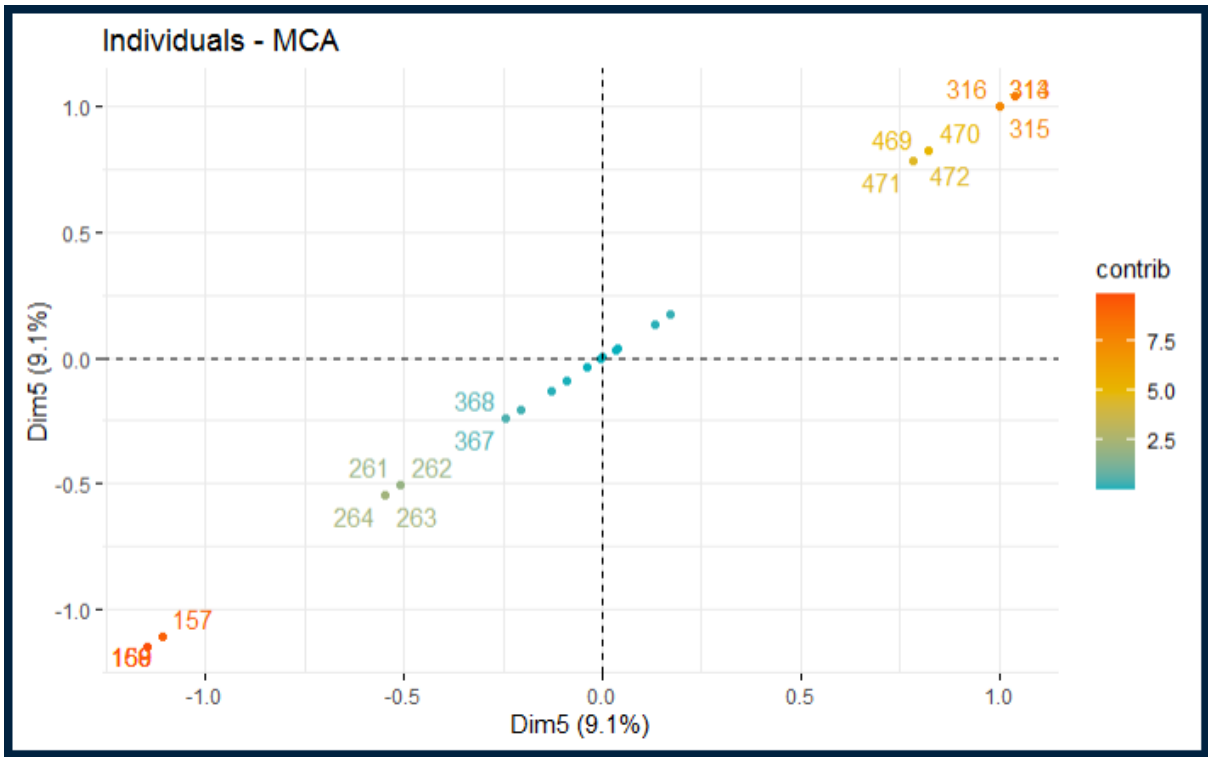
```
# Coord
fviz_mca_ind(USM, col.ind = "coord", gradient.cols =
c("#00AFBB", "#E7B800", "#FC4E07"), axes = c(5, 5), repel =
TRUE)
```



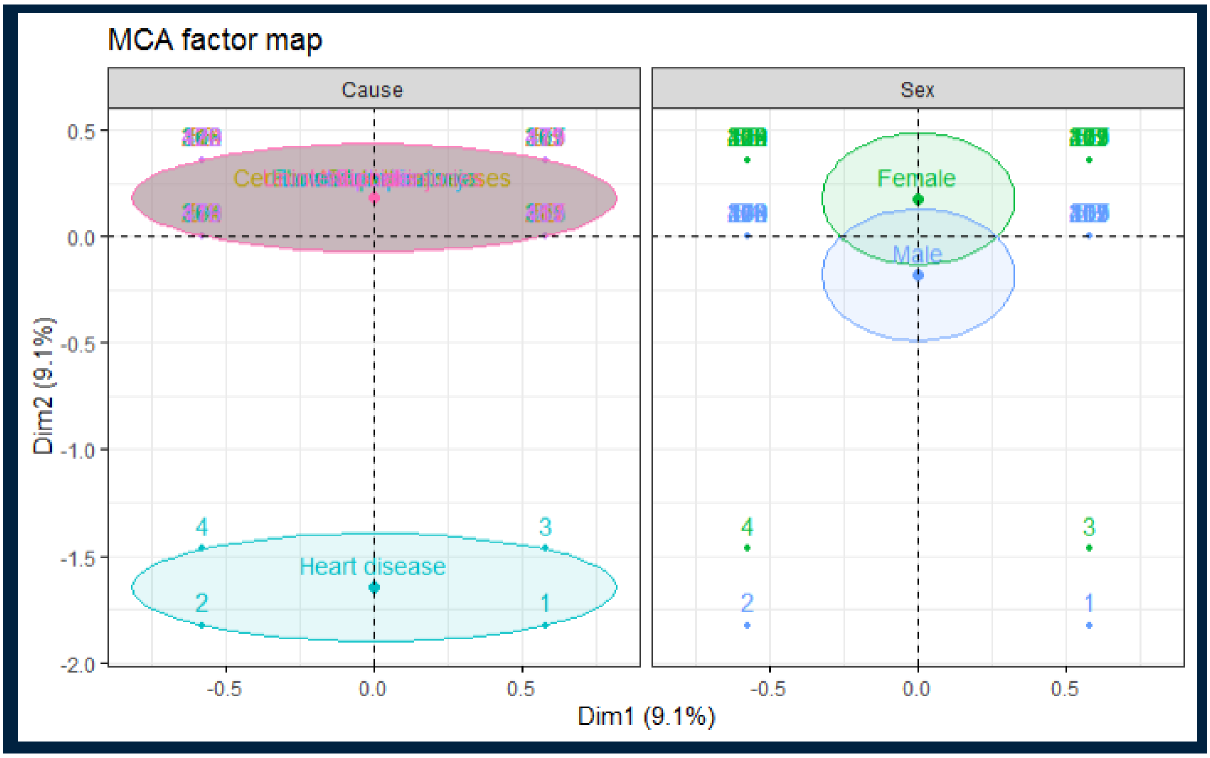

```
# Cos2
fviz_mca_ind(USM, col.ind = "cos2", gradient.cols =
c("#00AFBB", "#E7B800", "#FC4E07"), axes = c(5, 5), repel =
TRUE)
```



```
# Contrib
fviz_mca_ind(USM, col.ind = "contrib", gradient.cols =
c("#00AFBB", "#E7B800", "#FC4E07"), axes = c(5, 5), repel =
TRUE)
```




```{R}
# Color Individuals by Group
fviz_ellipses(USM, c("Sex", "Cause"))
```




```{R}
# Dimension Desctiptions
USM.desc <- dimdesc(USM, axes = c(1,2))
USM.desc
```

```
$`Dim 1`
$quali
       R2 p.value
Status  1       0

$category
               Estimate p.value
Status=Urban  0.5773503       0
Status=Rural -0.5773503       0

attr(,"class")
[1] "condes" "list"

$`Dim 2`
$quali
             R2      p.value
Cause 0.9039108 7.201403e-13

$category
                     Estimate      p.value
Cause=Heart disease -1.646734 6.321239e-21

attr(,"class")
[1] "condes" "list"

$call
$call$num.var
[1] 1

$call$proba
[1] 0.05

$call$weights
 [1] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

$call$X
```

Description: df[,4] [40 x 4]

	Dim 1 <dbl>	Status <fctr>	Sex <fctr>	Cause <fctr>
1	0.5773503	Status=Urban	Sex=Male	Cause=Heart disease
2	-0.5773503	Status=Rural	Sex=Male	Cause=Heart disease
3	0.5773503	Status=Urban	Sex=Female	Cause=Heart disease
4	-0.5773503	Status=Rural	Sex=Female	Cause=Heart disease
53	0.5773503	Status=Urban	Sex=Male	Cause=Cancer
54	-0.5773503	Status=Rural	Sex=Male	Cause=Cancer
55	0.5773503	Status=Urban	Sex=Female	Cause=Cancer
56	-0.5773503	Status=Rural	Sex=Female	Cause=Cancer
105	0.5773503	Status=Urban	Sex=Male	Cause=Lower respiratory
106	-0.5773503	Status=Rural	Sex=Male	Cause=Lower respiratory
107	0.5773503	Status=Urban	Sex=Female	Cause=Lower respiratory
108	-0.5773503	Status=Rural	Sex=Female	Cause=Lower respiratory
157	0.5773503	Status=Urban	Sex=Male	Cause=Unintentional injuries
158	-0.5773503	Status=Rural	Sex=Male	Cause=Unintentional injuries
159	0.5773503	Status=Urban	Sex=Female	Cause=Unintentional injuries
160	-0.5773503	Status=Rural	Sex=Female	Cause=Unintentional injuries
209	0.5773503	Status=Urban	Sex=Male	Cause=Cerebrovascular diseases
210	-0.5773503	Status=Rural	Sex=Male	Cause=Cerebrovascular diseases
211	0.5773503	Status=Urban	Sex=Female	Cause=Cerebrovascular diseases
212	-0.5773503	Status=Rural	Sex=Female	Cause=Cerebrovascular diseases
261	0.5773503	Status=Urban	Sex=Male	Cause=Alzheimers
262	-0.5773503	Status=Rural	Sex=Male	Cause=Alzheimers
263	0.5773503	Status=Urban	Sex=Female	Cause=Alzheimers
264	-0.5773503	Status=Rural	Sex=Female	Cause=Alzheimers

Description: df[,4] [40 x 4]

	Dim 1 <dbl>	Status <fctr>	Sex <fctr>	Cause <fctr>
313	0.5773503	Status=Urban	Sex=Male	Cause=Diabetes
314	-0.5773503	Status=Rural	Sex=Male	Cause=Diabetes
315	0.5773503	Status=Urban	Sex=Female	Cause=Diabetes
316	-0.5773503	Status=Rural	Sex=Female	Cause=Diabetes
365	0.5773503	Status=Urban	Sex=Male	Cause=Flu and pneumonia
366	-0.5773503	Status=Rural	Sex=Male	Cause=Flu and pneumonia
367	0.5773503	Status=Urban	Sex=Female	Cause=Flu and pneumonia
368	-0.5773503	Status=Rural	Sex=Female	Cause=Flu and pneumonia
417	0.5773503	Status=Urban	Sex=Male	Cause=Suicide
418	-0.5773503	Status=Rural	Sex=Male	Cause=Suicide
419	0.5773503	Status=Urban	Sex=Female	Cause=Suicide
420	-0.5773503	Status=Rural	Sex=Female	Cause=Suicide
469	0.5773503	Status=Urban	Sex=Male	Cause=Nephritis
470	-0.5773503	Status=Rural	Sex=Male	Cause=Nephritis
471	0.5773503	Status=Urban	Sex=Female	Cause=Nephritis
472	-0.5773503	Status=Rural	Sex=Female	Cause=Nephritis